DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

OCTOBER, 1935 CIRCULATION OF THIS ISSUE—IN EXCESS OF 10,000 COPIES 25c

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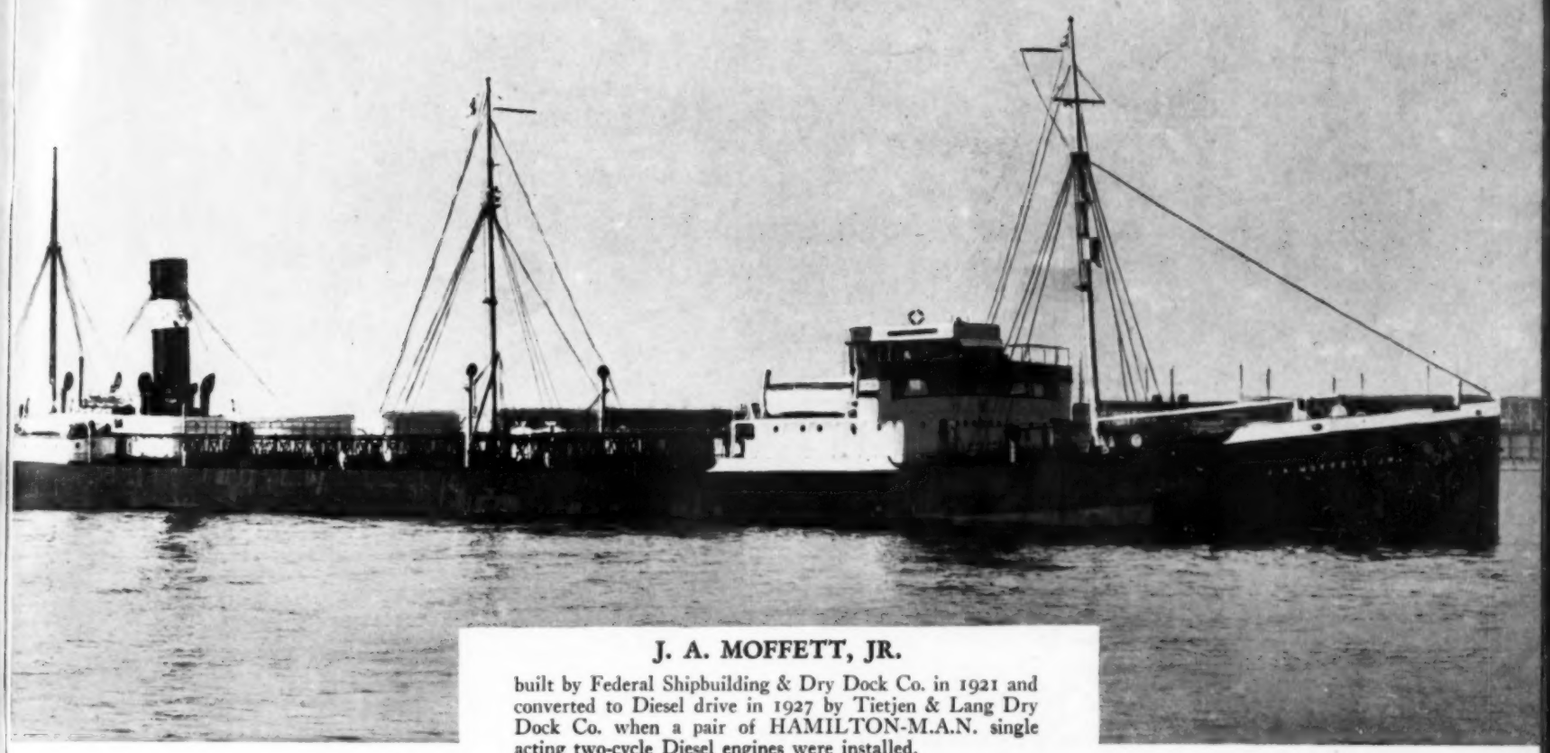

J. A. MOFFETT, JR.

built by Federal Shipbuilding & Dry Dock Co. in 1921 and converted to Diesel drive in 1927 by Tietjen & Lang Dry Dock Co. when a pair of HAMILTON-M.A.N. single acting two-cycle Diesel engines were installed.

Dimensions: Length — 500′ Breadth — 68′ Depth — 38′ 10¼″. Registered gross tons, 9,789; registered net tons, 6,137, deadweight tons, 15,620. Owned by Standard Shipping Company.

THE *J. A. MOFFETT, JR.* is but another outstanding Diesel achievement of the Hamilton Engine Shops. Since the two HAMILTON-M.A.N. single acting Diesels were installed in 1927 — eight years ago — the *MOFFETT* has successfully and economically logged the impressive total of 517,000 miles.

Whether it be in tankers like the *MOFFET*, combined freighters and passenger vessels like the *WICHITA* or the *NEW ORLEANS*, or huge municipal power plants like the 35,000 hp. Vernon, California, famous Diesel installation. HAMILTON-M.A.N. Diesel engines do an outstanding job.

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HAMILTON, OHIO

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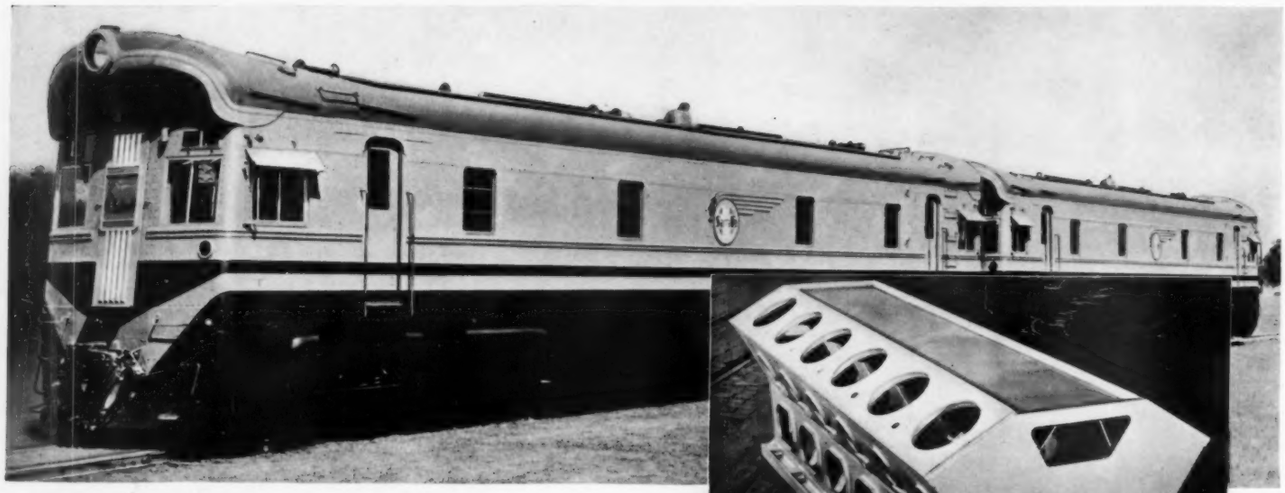


Atchison, Topeka & Santa Fe Ry. 3,600 hp. Diesel locomotive recently delivered by Electro Motive Corp. which will haul the Santa Fe's crack train, "The Chief."

ON THE SANTA FE
3,600 H. P.
DIESEL LOCOMOTIVE

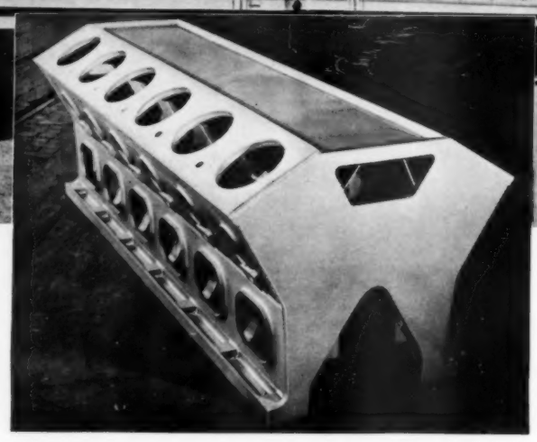
Winton Diesels With Welded Steel Cylinder Blocks and Crankcases Fabricated by LUKENWELD, Inc.

WELDED steel structures that are stronger, lighter in weight and yet more rigid, have played an important part in the development of the Diesel engine for railway service. Weight reduction in engine structures such as cylinder blocks and crankcases has made possible worthwhile increases in horsepower per axle.

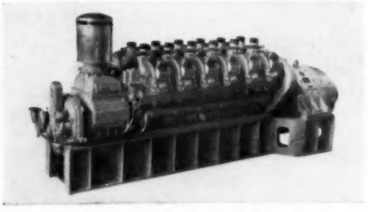
Lukenweld, Inc., in cooperation with Winton Engine Corporation, has pioneered in the design and fabrication of welded steel structures for Diesel engine service that have enabled engine builders to make continual reduction in the ratio of engine weight to horsepower.

If you are interested in eliminating useless weight in any type of machinery and equipment, send for a copy of "Welded Steel Diesel Structures" and the bulletin, "Lukenweld Construction." Write today, or use the coupon below.

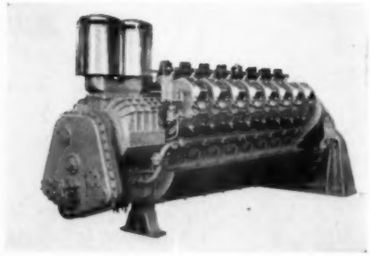
LUKENWELD, INC.
DIVISION OF LUKENS STEEL COMPANY
COATESVILLE, PA.



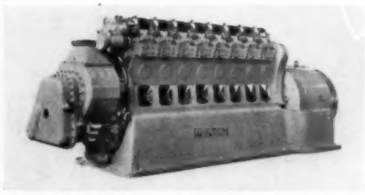
Welded steel cylinder block and crankcase fabricated by Lukenweld, Inc., for Winton 12-cylinder V-type Diesel engine.



Two-cycle Winton-Diesel engine, Model 201A-12, 900 bhp. at 750 rpm., 12 cylinders, V-type equipped with welded steel cylinder block and crankcase fabricated by Lukenweld, Inc.



Two-cycle Winton-Diesel engine, Model 201A-16, 1,200 bhp. at 750 rpm., 16 cylinders, V-type, equipped with welded steel cylinder block and crankcase fabricated by Lukenweld, Inc.



Two-cycle Winton-Diesel engine, Model, 201A-8, 600 bhp. at 750 rpm., 8 cylinders in line, equipped with welded steel cylinder block and crankcase fabricated by Lukenweld, Inc.

LUKENWELD, INC.,
COATESVILLE, PA.

☐ Send a copy of "Welded Steel Diesel Structures"
☐ Send a copy of illustrated book on "Lukenweld Construction"

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DP10-35

When Contractors go Diesel

they go ATLAS

IN the construction industry, where big jobs have to be completed on schedule, that's where machinery takes a beating. Contractors can't afford to baby their equipment . . . they have a job to be completed . . . if the capacity of their equipment has to be overtaxed to do the job, it's done. No matter what the job, the equipment has to be able to "take it".

That's the big reason behind the contractor's preference for ATLAS DIESELS. He has used ATLAS DIESELS for years for powering his shovels, drag-lines and locomotive cranes. He has used them in his locomotives; and as portable power units. They have run his air compressors and his water pumps. He has had them in his tow boats. He knows from experience that he can depend on the ATLAS DIESELS.

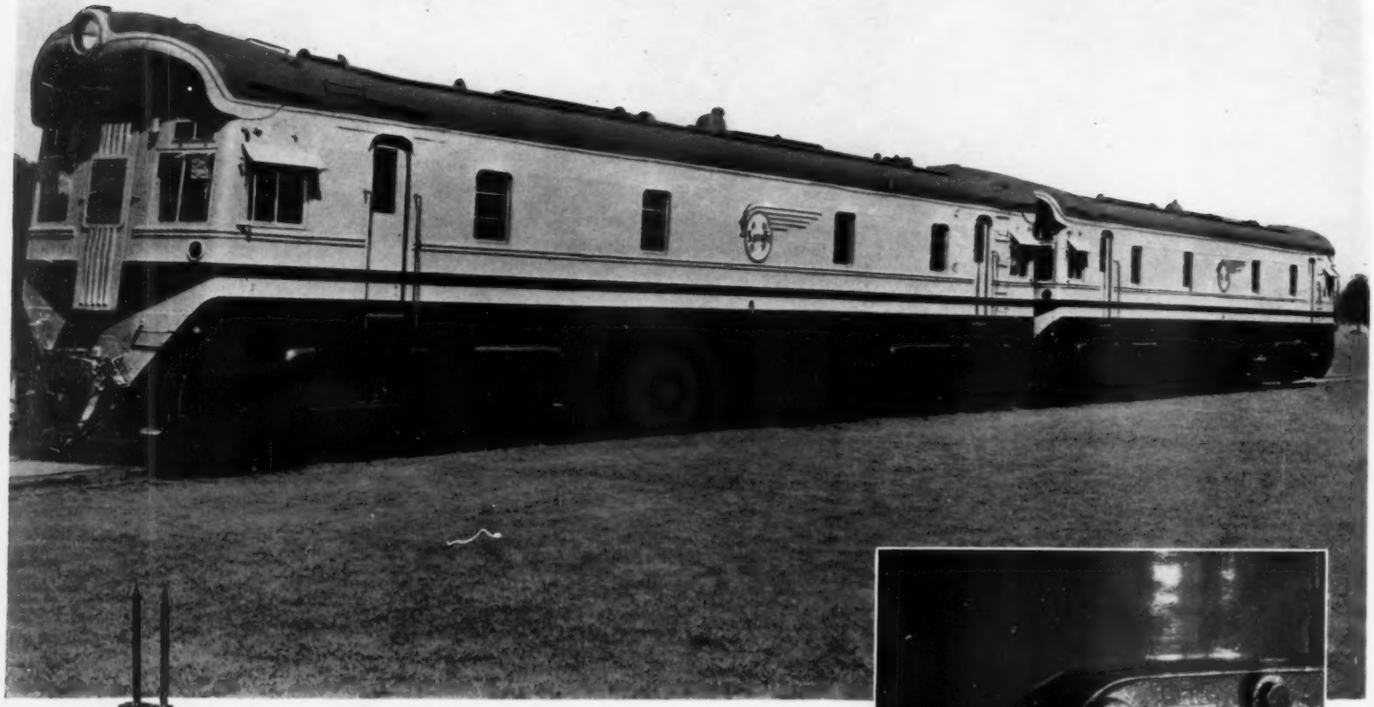
Pictured here are three applications of Diesel power as employed by the Kaiser Paving Company at their huge aggregate plant at Pleasanton, California. This plant, one of the largest and most modern of its kind in the world, has a capacity of 900 tons per hour, and provided most of the aggregate used in the construction of the San Francisco Bay Bridge.

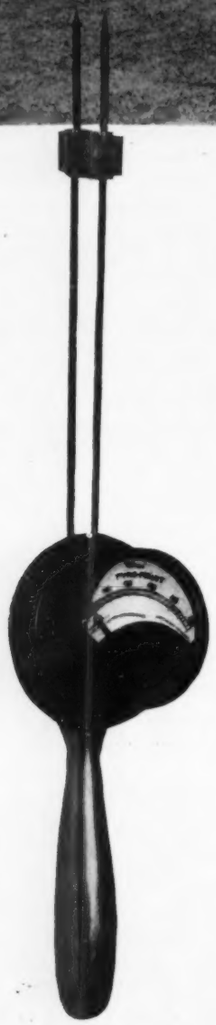
Shown above is a general view of the plant. At the left below is an ATLAS DIESEL powered Brownhoist loading a gondola soon to be "taken away" by the ATLAS DIESEL powered Plymouth Locomotive shown in the foreground. At the right below is an ATLAS DIESEL powered Monarch 75 tractor, still in daily service for Henry J. Kaiser, the man who pioneered the Diesel tractor.

If you have a power application . . . stationary, portable or marine . . . where you need dependable and economical power . . . buy the Diesel that has proved itself in the construction industry. That's the ATLAS DIESEL.

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIFORNIA • MATTOON, ILLINOIS

ATLAS IMPERIAL





"SUPER-CHIEF" "ALNOR" PROTECTED

THE most powerful Diesel locomotive in service — the Santa Fe's *Super-Chief* — which consists of two identical sections each containing two Winton V-type, twelve-cylinder high compression, two-cycle Diesel engines each rated at 900 hp. or a total of 3,600 hp., is protected with an "Alnor" exhaust pyrometer.

Each of the 48 cylinders has an "Alnor" thermo-couple with exposed terminals mounted in the exhaust pipe. The exhaust temperature readings are taken with an "Alnor" portable Pyro Point pyrometer.

The thermo-couples remain permanently in the exhaust pipes but no wiring or conduit is necessary. To obtain instantaneous temperature readings it is only necessary to contact the terminals of the thermo-couples with the points or prods of the Pyro Point pyrometer. The Pyro Point when not in use is placed in a case and is carried in a tool chest.

Every railroad operating locomotives powered with Diesel engines will find the "Alnor" Pyro Point pyrometer a very valuable instrument in helping to maintain maximum efficiency and economy.

Write for full information

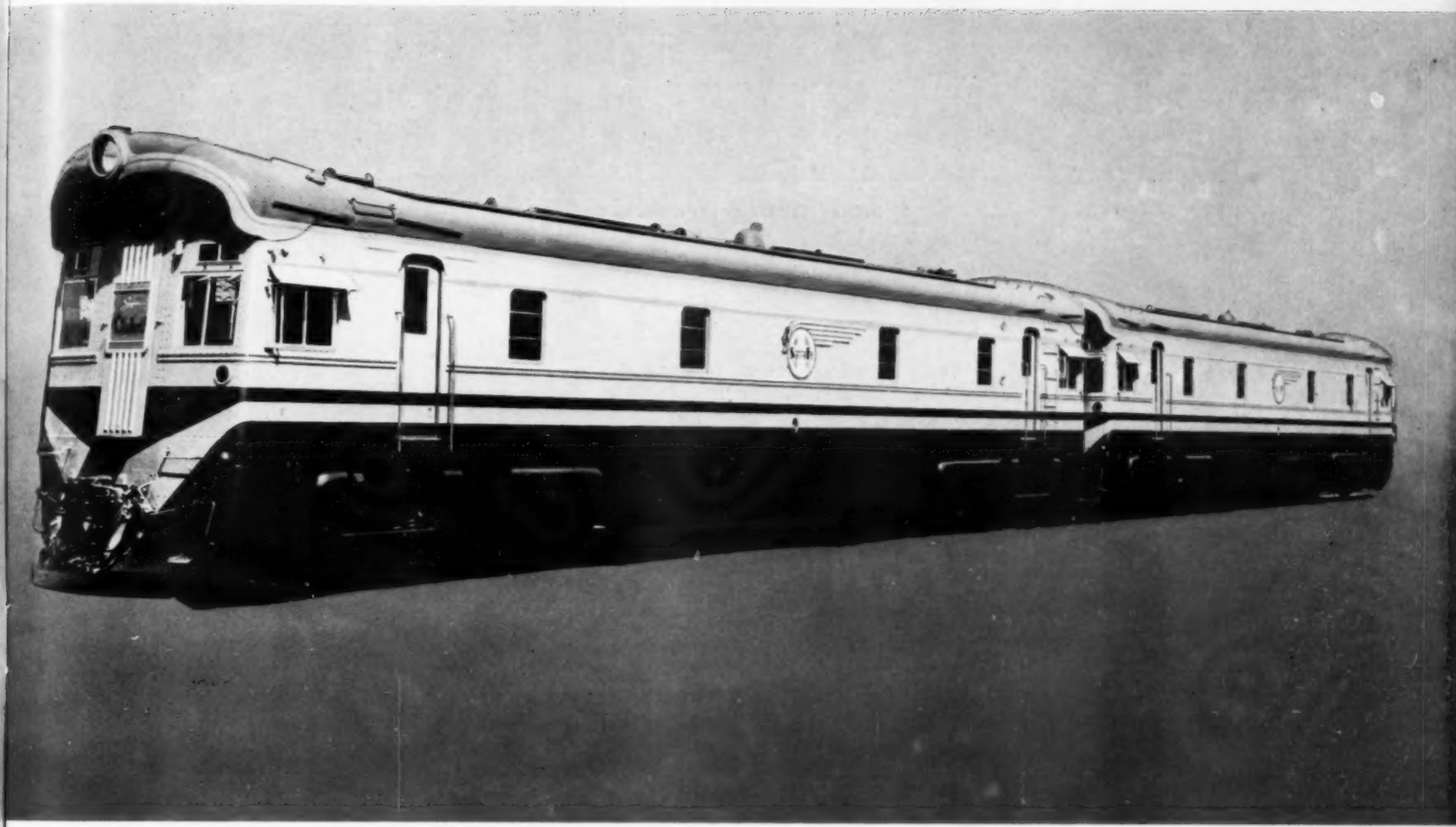
ILLINOIS TESTING LABORATORIES, Inc.

423 N. LA SALLE STREET, CHICAGO, ILLINOIS

Testing Engineers and Manufacturers of "Alnor" and "Price" Pyrometers.
The Products of 35 Years' Experience.

"Alnor" Pyrometers — *The Engine X-Ray*

The Last Word In
RAIL TRANSPORTATION



THE SANTA FE'S "Super Chief" is an important answer to a new tractional dimension. It goes from here to there with a speed that satisfies most mortal requirements . . . and carries a load that can't be lifted off the ground by any character of air transport thus far developed.

It is driven by a 3600 hp. Diesel Electric locomotive—and is powered with four 900 hp. 12-cylinder Winton Diesels. AND ITS OILING SYSTEM IS PROTECTED BY PUROLATOR OIL FILTERS.

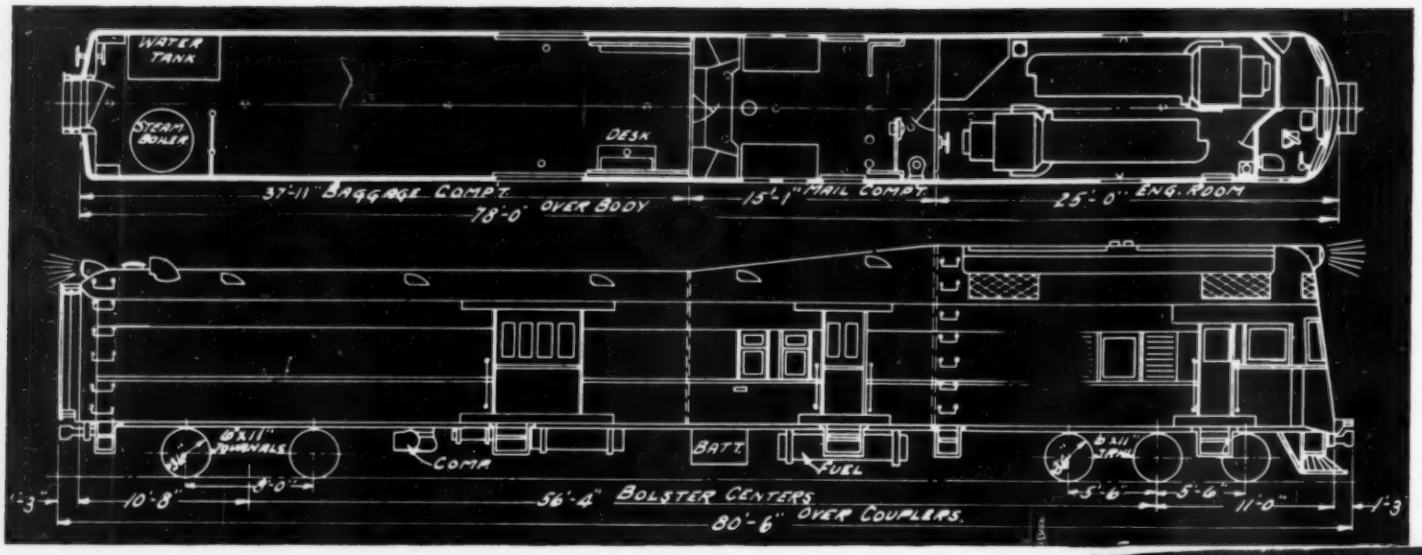
Speeds of the sort developed here, require constant and perfect lubrication.

It is only natural that the Purolator Oil Filter, with its background of successful performances . . . its record of engineering efficiency and filtration precision, should be selected for a job of this character.

Purolator Oil Filters have a proven record of efficiency . . . as the one perfect protection of both lube and fuel oil, in every character of Diesel operation. We invite consultation. Motor Improvements, Inc., Newark, N. J.

PUROLATOR

The Oil Filter



800 hp. BOSTON & MAINE Diesel Electric Railcar powered with a pair of 400 hp. Ingersoll Rand Diesels

INGERSOLL RAND built the two 400 hp. six-cylinder engines installed in the Boston & Maine Railroad's Railcar illustrated above. The crankshafts for these two engines were manufactured by **National Forge & Ordnance Company.**

Complete control of all Processing from selection of the melting charge to the finished condition is National Forge and Ordnance Company's guarantee for maintenance of quality in Crankshafts and various other types of forgings furnished to leading manufacturers in the Diesel Industry.

BASIC ELECTRIC STEEL FORGINGS

CARBON, ALLOY, CORROSION RESISTANT AND SPECIAL STEELS SMOOTH FORGED, HOLLOW BORED, ROUGH OR FINISH MACHINED, HEAT TREATED TO SPECIFICATIONS . . . FORGING QUALITY INGOTS, PRESSED OR HAMMERED BILLETS.

National Forge & Ordnance Co.

Irvine, Warren County, Penna.

Signed up

FOR HEAVY DUTY SERVICE WITH THE U. S. NAVY

ALL destroyers, gunboats and cruisers being constructed in U. S. Navy Yards under the 1933-34 program will be equipped exclusively with Goulds Hydroil Purifiers.

Heavy duty service in all parts of the globe under all sorts of operating conditions makes dependability of utmost importance. Diesel Engine fuel and lubricating oil must be kept pure and clean at all times.

For Marine use, Goulds Hydroils insure non-stop performance by removing all grit and dirt from fuel oil. This prevents shutdowns due to clogging of injector nozzles and reduces wear on moving parts. It likewise removes dirt, water and sludge from lubricating oil, making frequent oil changes unnecessary. This reduces operating and maintenance costs.

Let this record be your guide in the selection of purifiers for fuel and lubricating oils.

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GOULDS PUMPS Inc.

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BUDA

Powers the First American Diesel Mining Locomotive!

BUDA DIESEL ENGINES add another step in the broadening of their acceptance by those seeking dependability in power plants. Now comes The Ruth Company of Denver, Colorado, which standardizes on Buda Diesel Engines for their "Diesel Mine Mule."

Buda Diesels make available the flexibility and safety of internal combustion to mining, and due to the absence of carbon monoxide and low CO_2 content, have been approved by the U.S. Bureau of Mines for underground use.

Buda Engines have been proved in a wide variety of service. They bring the advantages of high horsepower, high speed, together with light weight. They have demonstrated their smooth running qualities, freedom from power loss, ease of starting, simplicity of upkeep and quiet, smokeless operation.

Specify a Buda Diesel for power.

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- Feed Grinders
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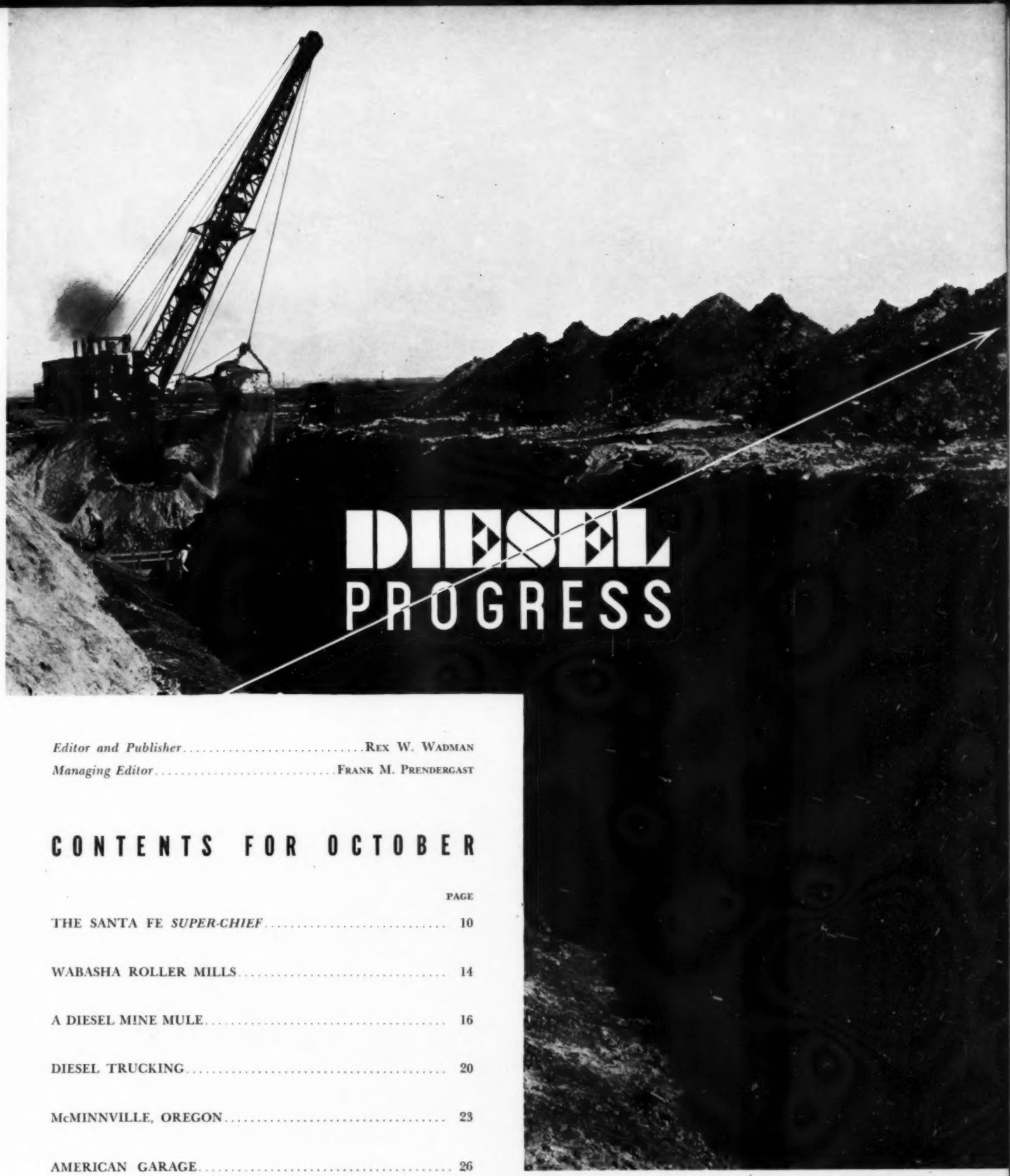
- Boats
- Trucks
- Hoists
- Sweepers
- Busses

Horsepowers
32 to 130

BUDA ENGINES



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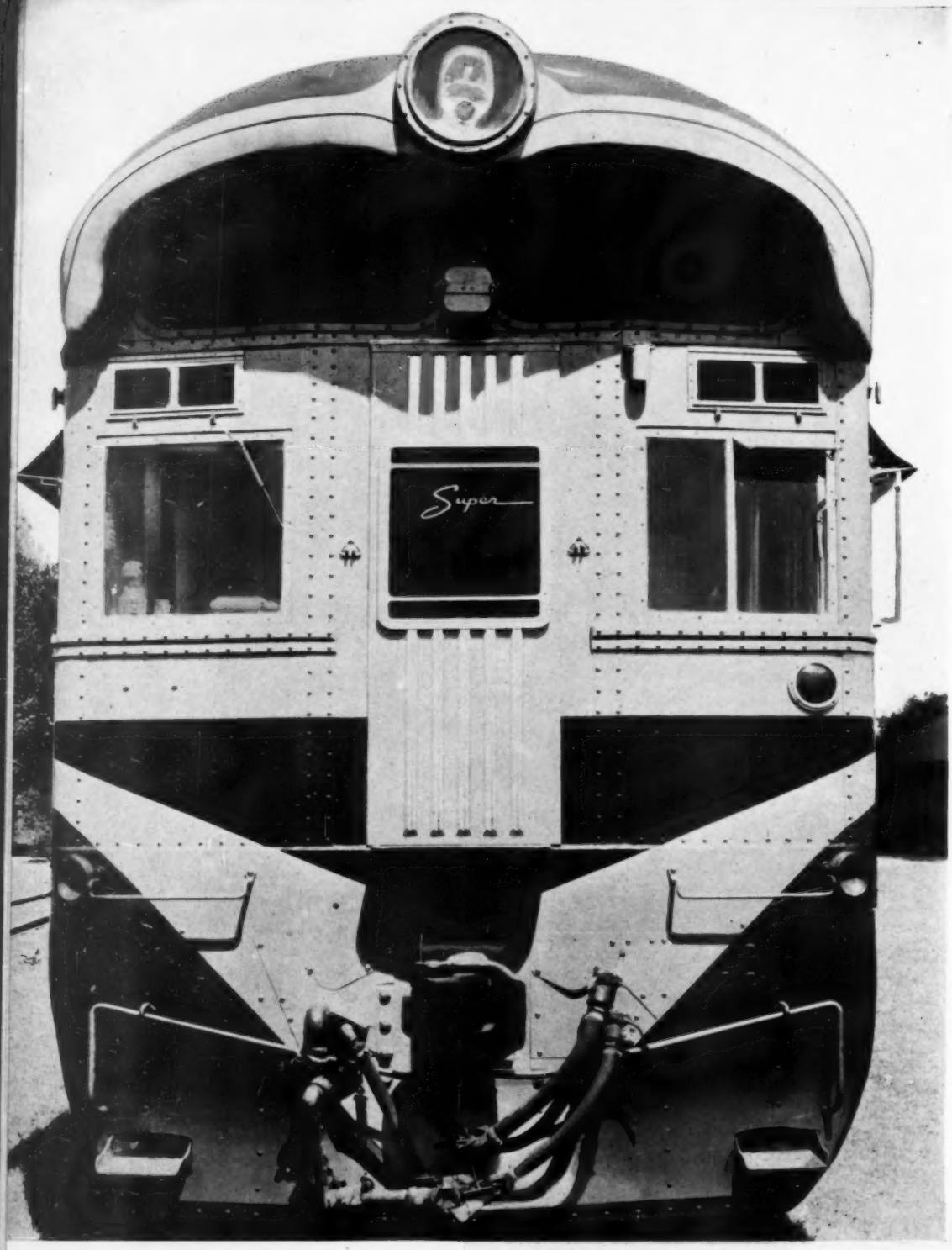


THE WORLD'S L

THE *Chief* is now the *SUPER Chief!*

Steam, long the motive force of Santa Fe's crack transcontinental flier, has bowed to Diesel. Well it may, for this new *Super Chief*, the biggest, most powerful Diesel-electric locomotive ever built, marks the beginning of a wholly new chapter in American railroading that will go down in transportation history.

Here, for the first time, is a giant capable of hauling one of the world's most famous trains, in scheduled passenger service, all the way from Chicago, over plains, deserts, mountains and valleys, through to Los Angeles, a distance of 2,225 miles without engine change, such as is customary with the use of steam locomotives, which for practical operating purposes must be changed at division terminals.

Furthermore, it will reduce materially the existing running time, which has already been shortened to 53 hours and 45 minutes, because of its greater adaptability to track conditions and the elimination of fuel stops.

The advantages of the Diesel-powered *Super Chief*, so far as improved schedules are con-

A head-on view of the most powerful Diesel-electric locomotive ever built. On the opposite page is illustrated one of the "Super Chief's" four V-type 12-cylinder Winton Diesels, each of which develops 900 hp.

LARGEST DIESEL-ELECTRIC LOCOMOTIVE

New 3,600 hp. Super Chief Just Placed in Service by Santa Fe Destined to Make Railroad History

cerned, are four-fold. First is its low center of gravity. Second is its rotating type of motive force, permitting much higher speeds around curves and over bridges and other operating checks than has been possible heretofore with steam locomotives. Third, it has faster get-away because of quicker acceleration, due to the inherent characteristics of its electrical transmission. Fourth, its ability to travel longer distances without servicing, reduces to an absolute minimum the time out for stops required by steam powered locomotives for water, fuel, mechanical checkings and the changing of engines at the end of each run. And, of course, the *Super Chief* is fast—very fast with regard to *safe* operating speeds, its maximum safe speed being conservatively set at 98 miles an hour.

The new *Super Chief* is known as a double cab type of locomotive. It consists of two identical units, operating as a single unit. Either unit can be operated singly or together, coupled with any desirable number of similar units. Each unit is arranged for double-end operation, with an operator's cab and control station at either end. From these control stations the engineer is afforded a clear view ahead on both sides of the track. Actually it is a multiple unit type, flexible to permit either a reduction or an addition of power, simply by uncoupling one unit or hooking on others. Unlike the earlier, articulated streamliners, the *Super Chief* is a main line locomotive built to haul standard railroad passenger equipment of any length, instead of being merely a component part of an integral and inflexible unit.

With an over-all length of 127 feet, the *Super Chief* presents a far different appearance from the "iron horse" it supersedes. Though only moderately streamlined a most pleasing effect has been obtained by skilful modifications in the steel jackets that conceal every detail of the driving machinery, by the molding and slope of the somewhat blunt ends, as well as the neatly turned in steel "skirts" with removable sections that cover the wheels and underbody. A most attractive color scheme in black, cobalt and sarasota blues, golden olive and scarlet, rivaling the brilliance of Grand Canyon hues at sunset, worked out by the Art and Color department of the General Motors Corporation, and the Santa Fe's emblem on each side of the locomotive, add to its clean and distinctive appearance.

Even the most casual observer cannot fail to get a definite impression of its tremendous, surging power, when its throbbing pulses heighten from a dull rumble to a muffled roar as the train glides away on roller bearings, literally gathering speed with every foot of distance. Flying along the rails under the mighty force of 3,600 hp. it conquers time and distance as no other locomotive has done heretofore, hauling in addition to its own weight of 240 tons, a heavy train of coaches.

A look "under the hood" will disclose very quickly the reasons why the *Super Chief* is a super locomotive. The motive power of each unit is supplied by two V-type, 12-cylinder, 8″ x 10″, two-cycle high compression Winton

Diesel engines of 900 hp. each. There are four in all, making a total of 3,600 hp., all of which are available for traction force. Power for the auxiliary requirements of the locomotive and the train is generated by separate Diesel-electric generating units, which will be described in detail later in this article.

Each engine is direct connected, but flexibly coupled, to a direct current generator of sufficient capacity to transmit continuously to the traction motors the rated horsepower output. The power developed by these main Diesel-electric units, which are bolted in perfect alignment to the locomotive underframe, is delivered to four railway traction motors mounted between the driving wheels.

These engines, despite their great energy output, are extremely light in weight, weighing less than 20 pounds per horsepower. A newly developed manufacturing process by Winton engineers has now made such weight reduction possible. Rolled steel plates are welded by Lukenweld, Inc., to form a single piece engine block, comprising the crankcase and cylinder block to which a lightweight oil pan is attached.

A seven-bearing Erie crankshaft is carried on main bearing seats fastened to the end of the individual cross-members, cut to form frames for the above described fabricated engine block. By this method combustion stresses are transmitted direct to the bearing seats, through solid frames held rigid by the various patterns of welded plate, which incidentally form the air intake passages. Steel-backed, lead alloy faced, main bearing liners, supplied by the American Bearing Corporation, 6¾ inches in diameter, are clamped by shimless bearing caps held in place with jack-screws acting against the frame arch below the cylinder block.

Water jacketed cylinder liners of heat-treated cast iron are bolted to the cylinder heads, which in turn are fastened in the usual manner to the cylinder block. Twenty-four slanted, air-intake ports are cast about midway of the length of these water jacketed liners, circling the liner, which transverses the hollow cylinder block. Thus, the cylinder block forms an ideal air-intake manifold in which pressure is maintained by a three-lobed, twin rotor, scavenging blower, or compressor, mounted on the front end of the engine block.

This arrangement of air-intake, and the use of four exhaust valves for each cylinder, insures complete scavenging of the cylinder at a minimum blower pressure. The piston heads of the Bunite aluminum alloy pistons are cooled by a stream of oil emitted from the top of special I-section connecting rods fitted with six-inch-bore bearing liners.

One of the interesting features of the installation is the method used to insure a continuous supply of clean fuel and lubricating oil to the twenty-four cylinders of the power plant and the four-cylinder auxiliary plant providing light and brake service in each unit. On each of the two 12-cylinder Diesels, three metal-edge Purolator filters are introduced between the low-pressure and the high-pressure fuel pumps. These filter the fuel oil before it is forced into the firing nozzles. Further insurance against the presence of any contamination there is provided by the use of a jet Purolator in each nozzle.

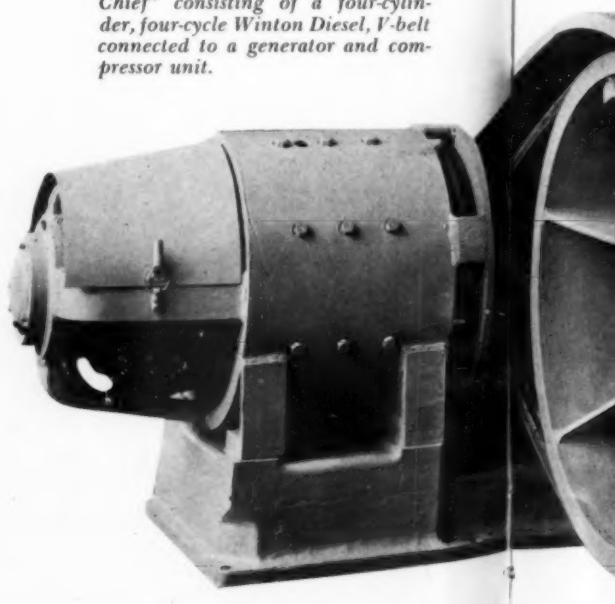
The jet filters are tiny affairs, only an inch or two in length, and of a diameter scarcely greater than that of a lead pencil. The main Purolators have filtering elements 5.6 inches long by 2.625 inches in width. Each has a slot area of 14.04 square inches and a slot opening 390 FEET in length. The element is made of bronze ribbon wound upon a corrugated frame. It is movable by means of a handle in the head which turns the surface against a fixed knife blade for cleaning. The lubricating oil filters are of similar size and construction. two of them in the main oil line sufficing to keep the oil supply free of abrasives and other contamination. Jet Purolators are used on the auxiliary Diesel which receives its fuel and lubricating oil from the same source as the main engines without further filtration.

While it has not proven practical, on Diesel electric locomotives, to use permanently installed pyrometers, the *Super-Chief* is equipped with an Alnor Pyro-Point portable pyrometer for each unit. Each cylinder of the main and auxiliary engines is equipped with a thermocouple and the exhaust temperature of any cylinder can be quickly obtained by the use of the portable Pyro-Point pyrometer.

Engine cooling follows an entirely new departure on the *Super Chief*. Heretofore, air circulation with roof type radiators was provided by the motion of the train. In this instance the customary roof radiators are regrouped to form two long sections and are suspended from the roof inside the engine room. Two large engine-driven fans are mounted above the partition separating the engine room from the control cab. A grilled opening in the front of the locomotive just under the head-light, admits air to the fans via a duct formed by the cab coiling and the roof. By systematically locating outlets in line with the radiator installation, the large volume of fresh air brought to the engine room is made to circulate through the cooling radiators. This method of handling the air intake results in but a minimum disturbance of the air stream at the head of the locomotive and provides a thoroughly ventilated engine room. Because of restricted outlet areas, a slight pressure is formed within the engine room, causing air to flow downward and create ventilation for the traction motors.

A 32-cell Exide storage battery in each cab, having a capacity of 450 ampere hours at the ten-hour discharge rate, furnishes the power for engine cranking, the locomotive headlight. cab and train lights, the control apparatus of the electrical transmission and auxiliary equipment in the train, and the air conditioning system. Constant potential battery charging, regardless of load or engine speed conditions, is supplied by a 60 kw. auxiliary generator driven by the engine generator set mentioned on the preceding page, and described more

The Auxiliary Diesel set installed on each 1,800 hp. of the "Super-Chief" consisting of a four-cylinder, four-cycle Winton Diesel, V-belt connected to a generator and compressor unit.



fully below. The locomotive has a fuel tank capacity of 1,600 gallons.

As previously stated, the locomotive's main engines of 900 hp. each are employed solely to drive the train. All auxiliary light and power needs for the locomotive and train, and air for the brakes, are furnished by a special 4-cylinder, 5¼" x 7", four-cycle Winton Diesel combination generator and compressor unit. This engine is rated at 90 hp. at 1,000 rpm. There is one of these for each locomotive unit. It is illustrated on this page. The cylinder block and upper crankcase is made of chrome nickel iron. A one-piece casting provided with side plates permits easy access to main and connecting rod bearings and camshaft. The compressor is a four-cylinder two-stage water cooled type, with a displacement capacity of 185 cubic feet a minute. The air compressor is driven by a multi V-belt drive, completely enclosed by metal housing.

Among the many new features developed for the *Super Chief* is a steam generating unit for heating and air-conditioning the train. This car heater is a light weight, compact, automatic unit, consisting of a boiler and forced-draft, fuel oil burner, drawing its fuel from the same storage tanks that supply the main power plant. It has an evaporation capacity of 2,000 pounds of water an hour at a working pressure of 200 pounds. The water capacity of this unit is 2,500 gallons, or enough to operate the unit for ten hours at maximum capacity without stopping for water.

At each control station of the locomotive is located the main throttle, engine auxiliary throttle, master controller, and miscellaneous push-button switches necessary to the control of the Winton auxiliary power unit.

Completing its preliminary tests on September 16, the *Super Chief* arrived at Chicago after a 4,500-mile round trip to the Coast, on which it hauled nine heavy standard passenger and baggage cars weighing over 720 tons. On the westbound trip the train attained a momentary speed of 111 miles an hour west of Goffs, California. On its eastbound trip it traveled at 110 miles an hour for two miles between Flagstaff and Winslow, Arizona.

Santa Fe's vice-president in charge of operations, W. K. Etter, who made the trip, expressed the belief that a reduction of as much as twelve hours in the *Chief's* present westbound schedule of 53 hours and 45 minutes seemed feasible with existing track conditions. However, the Santa Fe has put 1,500 extra men to work improving the roadbed, straightening curves and reducing grades in preparation for the faster runs.

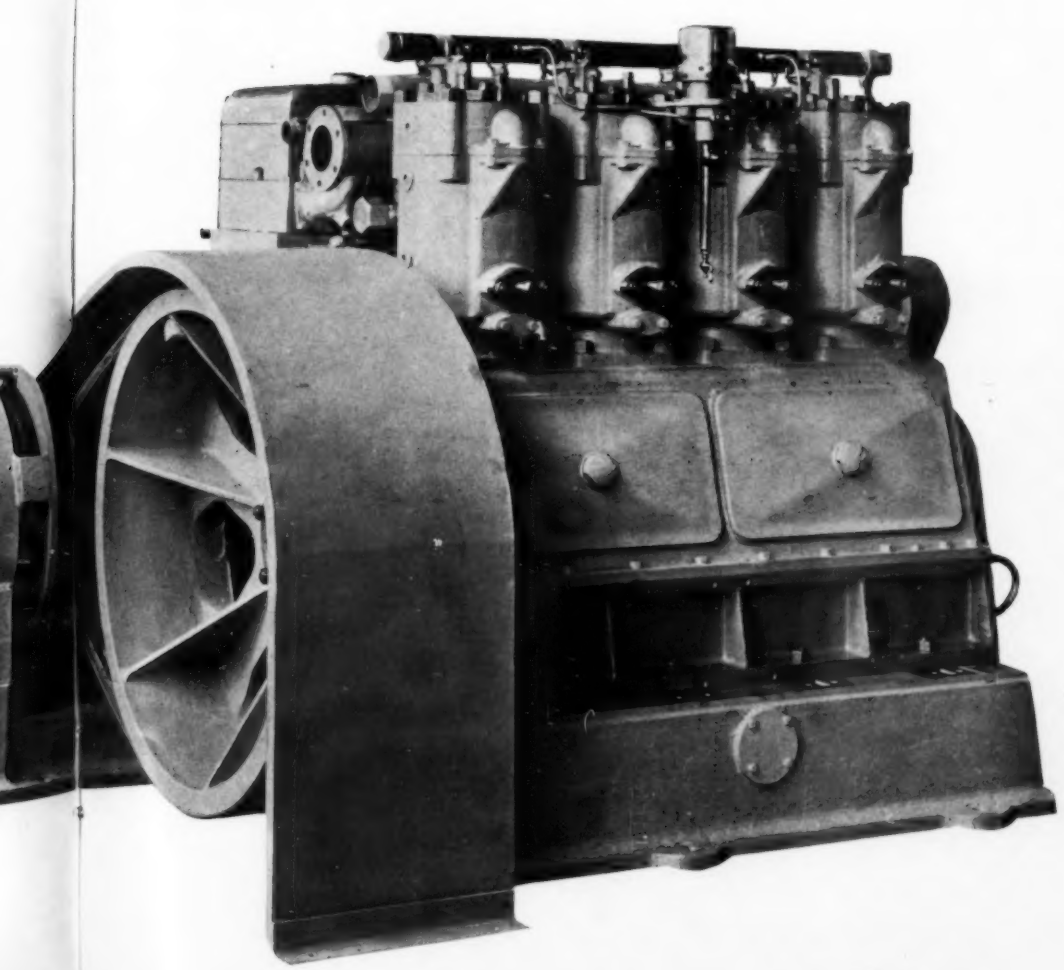
The initial cost of the new *Super Chief* is said to have been $360,000, though its substantially lower fuel and operating costs and appreciably greater efficiency is expected to more than offset that investment. It was built by the Electro-Motive Corporation of Chicago, a subsidiary of General Motors Corporation, and will undoubtedly be the forerunner of many others of its type.

Yet its cost does not seem high if the Santa Fe *Super Chief* can emulate the record of the Burlington *Zephyr*, which during runs last May, demonstrated it could operate for as low as 31 cents a mile as compared with an equivalent steam train which costs 71 cents a mile to operate – more than double that of the Diesel-electric train.

Certainly from a fuel cost standpoint the Santa Fe is fortunate. Both termini are located at refining centers where fuel should be available at minimum cost.

As economists have already pointed out, the solution of the railroad problem must come from two directions – an increase in traffic and a reduction in expense. The *Super Chief* evolves this problem in both phases. In the 75 years dating back to the Santa Fe's beginning when it was organized in 1860 and up to the present with its 13,428 miles of track and a total investment at the beginning of last year of $1,152,352,986, never has there been a more significant event than the inauguration of the *Super Chief* – the world's mightiest Diesel-electric locomotive.

As this article goes to press announcement is made that a duplicate of the *Super Chief*, a 3,600 hp. double unit built by the Electro-Motive Corporation for test purposes, has just completed a remarkable run of 1,114 miles, from Jersey City to St. Louis, on the Baltimore & Ohio Railroad and then, two hours later, took the regular Alton train to Chicago, an additional distance of 284 miles. On the run from Jersey City to St. Louis, the Diesel electric locomotive hauled ten standard steel cars, or an average of 757 tons for the trip. Between St. Louis and Chicago twelve cars were hauled or an average of 808 tons. The engine itself weighs an additional 240 tons. This trip constitutes up to the present, the longest run ever made by a heavy, Diesel-powered train of standard all-steel Pullman equipment, without change of engine and stopping only for re-fueling and for the purpose of discharging and boarding passengers. However when the *Super Chief* goes into regular service on the Santa Fe, her trip mileage of 2,225 miles will create a new record.



BIG JO HALVES ITS POWER BILL

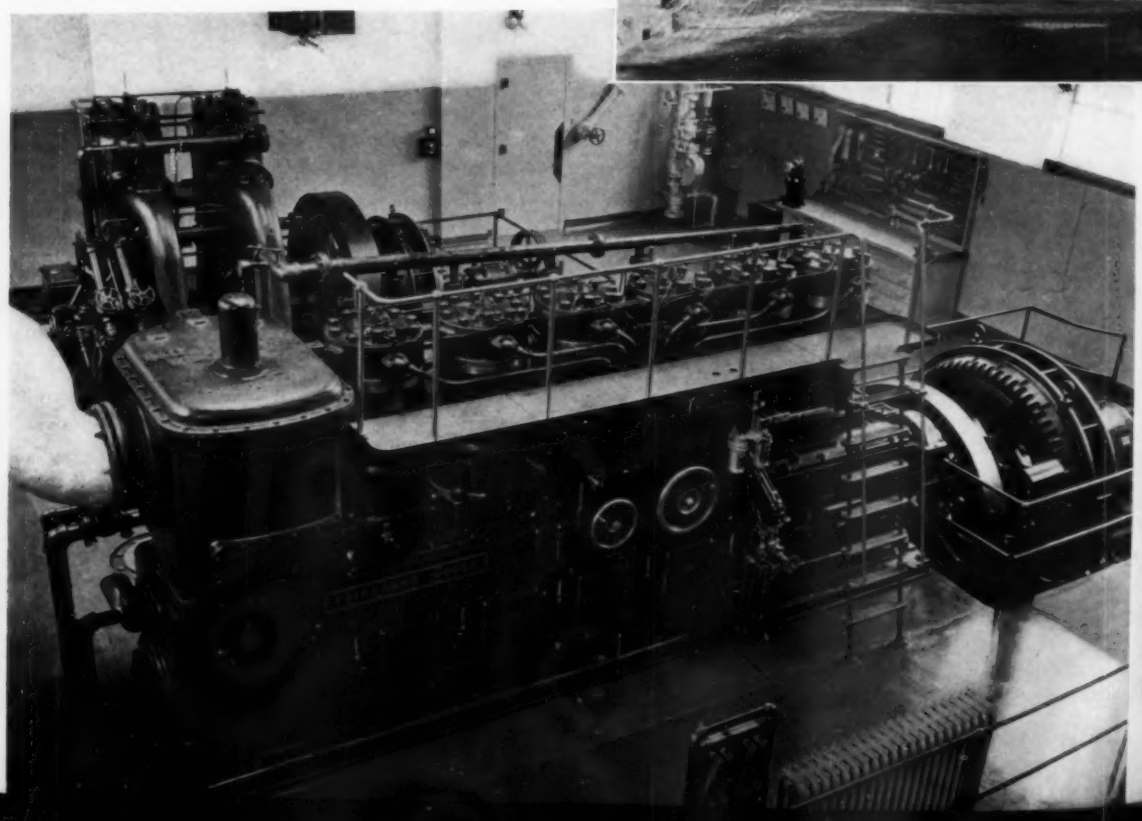
By B. A. SNARENBERGER

IT'S a far cry from the early days of milling, with their crude water wheels, to the modern mill with its up to date Diesel plant. A Diesel plant installed in the Wabasha Roller Mills at Wabasha, Minn., represents the latest developments in engineering, application and efficiency of this type of power.

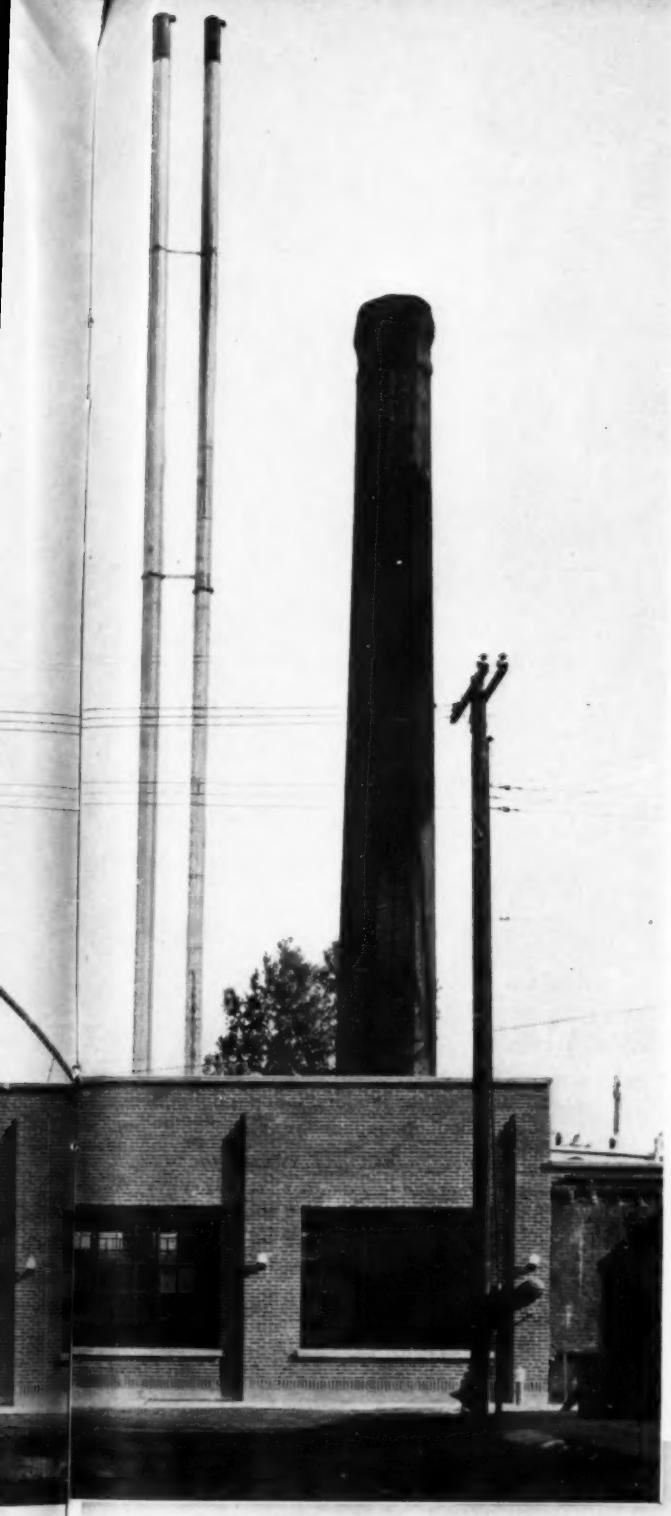
This mill was originally operated with a steam plant. Then through obsolescence of the steam plant, and the development of lower and more attractive rates by the power company, the steam drive was discarded and subsequently the mill was electrified.

The power company had enjoyed the business of the mill for some twenty years, with various and sundry power rates in effect during this period of time. However, with the depression and curtailment of the milling industry, and the resultant price situation that followed, it was necessary to check milling costs and reduce them wherever possible.

The question of power then became a paramount issue and an item that stood out on their books with such prominence that action



An exterior view of the Wabasha Roller Mills power plant. Below is a glimpse of the power plant looking down on the 630 hp. six-cylinder Fairbanks-Morse engine, Power Unit No. 1.



SUMMARY OF SAVINGS

770 HP. FAIRBANKS-MORSE DIESEL PLANT INSTALLED IN WABASHA ROLLER MILLS, WABASHA, MINNESOTA

Covering Nine Month Period — October 1, 1934, to July 1, 1935

Month	Kwhrs.	Fuel and lubr. oil cost	Taxes and insurance	Maintenance reserve	Supplies	Total Diesel cost incl. fixed ch'gs	Purchased power cost	Savings
1934								
October ...	147,200	$662.00	$52.33	0	$ 2.40	$717.00	$1,677.00	$960.00
November..	125,600	632.00	52.33	0	17.59	702.00	1,534.00	912.00
December..	122,400	583.00	52.33	0	2.97	638.00	1,531.00	874.00
1935								
January ...	113,600	$613.00	$52.33	0	$10.35	$676.00	$1,454.00	$778.00
February ..	102,400	579.00	52.33	0	17.95	649.00	1,368.00	719.00
March	110,400	538.00	52.33	0	7.95	598.00	1,425.00	827.00
April	116,000	694.00	52.33	0	9.10	755.00	1,455.00	700.00
May	120,800	650.00	52.33	0	12.20	714.00	1,501.00	784.00
June	111,200	665.83	52.33	0	14.23	732.39	1,438.00	706.00
TOTAL....	1,069,600	$5,616.83	$470.97	0	$94.74	$6,181.39	$13,383.00	$7,260.00

Total consumed in 9 months ..... 1,069,600 kwhr.
Cost per kwhr.—Purchased power ..... $1.25 per kwhr.
Cost per kwhr.—Diesel generated power including fixed charges.... .57 per kwhr.
SAVINGS, per kwhr.—With Diesel generated power ..... $ .68 per kwhr.

had to be taken towards its reduction, even though this rate had averaged 1¼c per kwhr. for several years.

The power company was called in and told to submit its best proposition. Several Diesel manufacturers were asked to submit their recommendations and reports on the cost of operation. The power company offered a new wholesale, combined, demand and energy rate on a sliding scale with the demand based on kva., necessitating power factor correction in the mill, on the following basis:

DEMAND

First	100 kva. @ $1.50 per kva.
Next	100 kva. @ 1.25 per kva.
Excess	kva. @ 1.00 per kva.

ENERGY

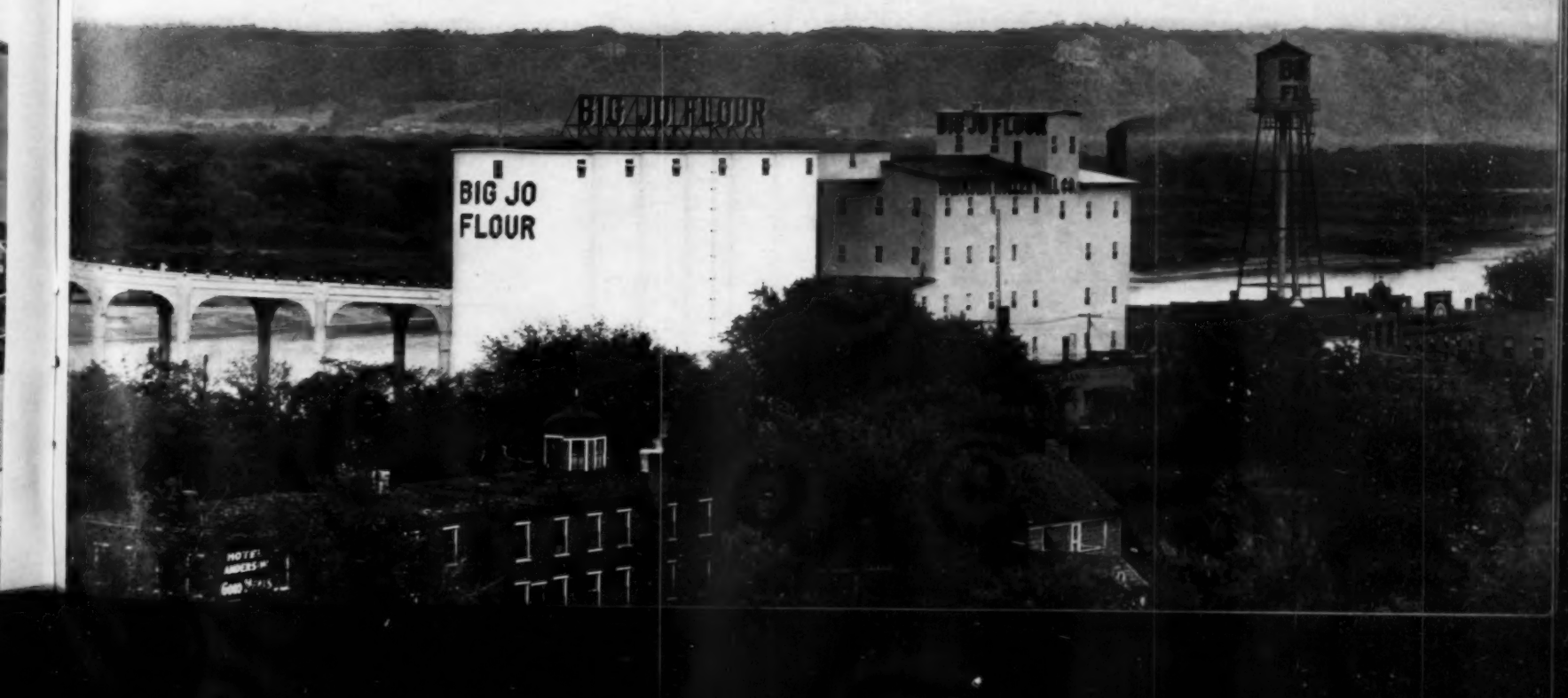
First	10,000 kwhr. @ 1.4c per kwhr.
Next	10,000 kwhr. @ 1.2c per kwhr.
Next	30,000 kwhr. @ 1.0c per kwhr.
Next	50,000 kwhr. @ .8 per kwhr.
Excess	kwhr. @ .7 per kwhr.

Cash Discount 5%

By correcting the power factor and bringing it up to unity and with the consumption of energy of approximately 2,000,000 kwhr. per year, which was the mills' average consumption, the new power rate figured out to approximately 1.07c a kwhr. This meant an average power cost per year of approximately $21,400.00, which still left them at a decided disadvantage in comparison with some of their more progressive competitors.

Serious consideration was then given to the question of Dieselization. Engineers from Fairbanks, Morse & Co., made a complete survey of the mill, ascertained the load on each motor, and constructed a load curve covering a 24-hour period of operation. The result was the recommendation of a 630 hp., 514 kva., 430 kw. unit, and a 140 hp., 112 kva., 90 kw. unit. The plant was divided in this manner with the idea of utilizing the power of both Diesel units during the day period when the mill and elevator were both in operation. With the elevator off the line, and only the

. . . . *And now please turn to page 34*



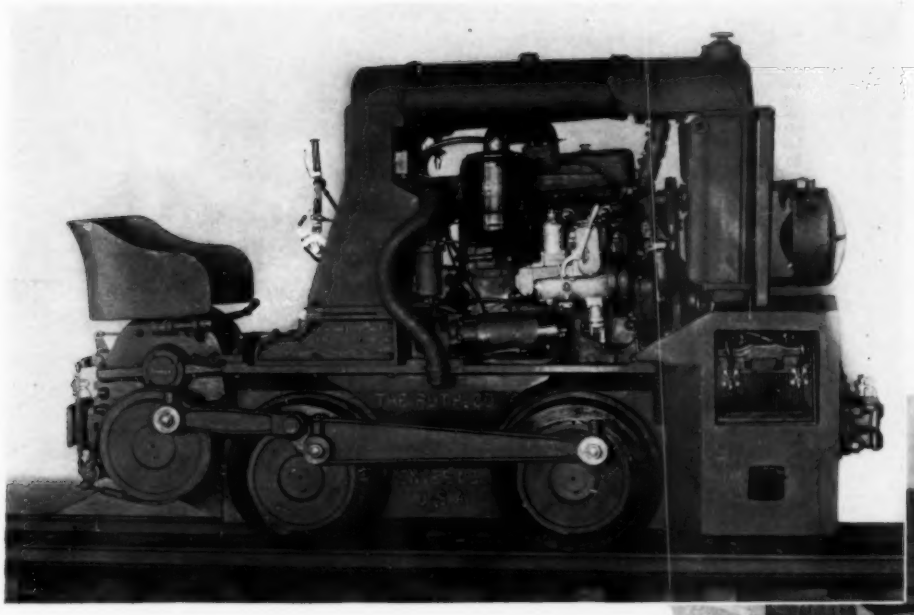
MAUD IS GOING

THE mining industry is going Diesel. Four-footed Maud, Jenny and the rest of her patient, plodding sisters who have been hauling ore cars on galleries deep in the bowels of the earth all these years, now face the spectre of technological unemployment. The Diesel mine mule has arrived.

Diesel locomotives have been found especially desirable for underground use because their exhaust contains no carbon monoxide. Tests show that a Diesel engine discharges no monoxide from idling to full load speed. Says the U. S. Bureau of Mines: "If the ventilation requirements are met and other precautions are taken, it appears to be reasonably safe to employ Diesel locomotives which use a heavy, non-volatile fuel oil."

The Ruth Diesel Mine Mule pictured here has a maximum tractive force of 6,800 pounds and drawbar pull as high as 2,400 pounds in first gear. It has four speeds forward and two for reverse, one so designed as to permit five speeds in either direction. It weighs three tons, is 8½ feet long, 5 feet high, and runs on 18-inch gauge tracks. Its engine is a four cylinder, four cycle, specially designed Buda Diesel, rated at 33 bhp. at 1,600 rpm. It has a bore of 3⅝ inches and stroke of 4½ inches, and a piston displacement of 186 cubic inches. The clutch is also of special design, enabling the torque from the engine to be firmly and positively transmitted to the gears, and is totally enclosed and protected from grease and dirt.

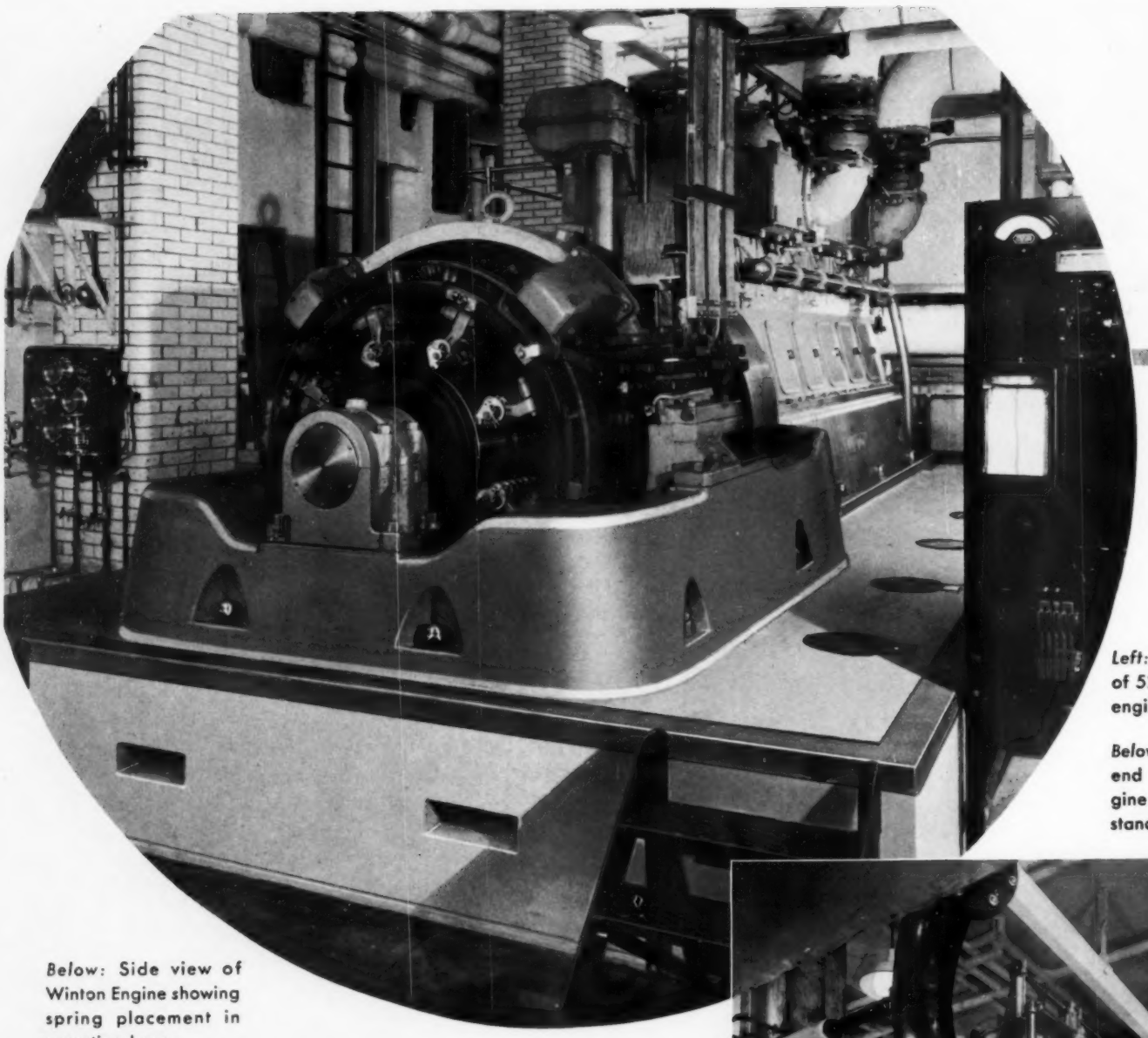
Automotive type brakes, lined with non-burn brake lining, acting on the crank discs, provide smooth and positive braking to all four wheels



A side view of the Ruth Mine Mule showing the 3⅜" x 4½" Buda four-cylinder Diesel which is connected to the reverse gear box through a Borg and Beck oversize single plate clutch and Fuller transmission.

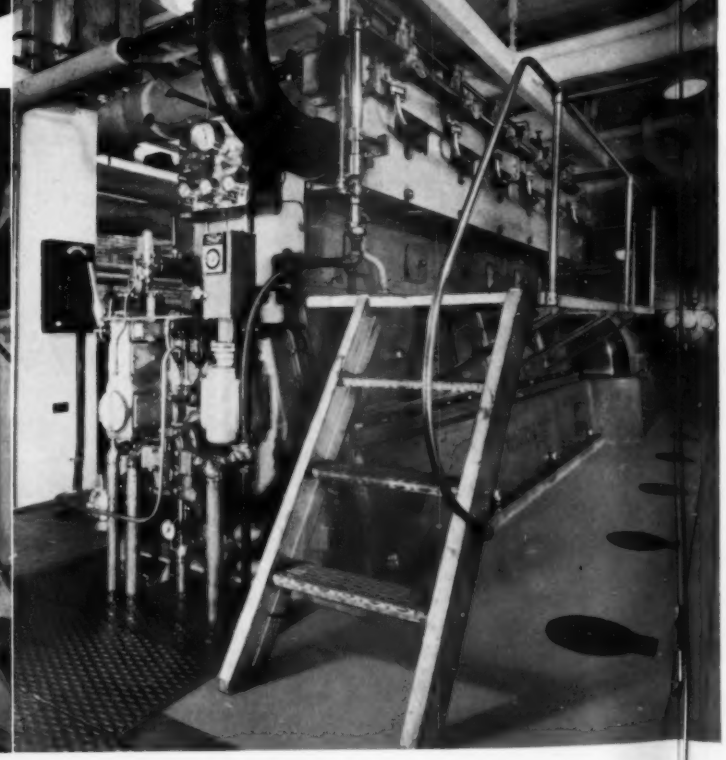
through the driving rods, which are of cast steel with integral grease cups and phosphor bronze bushings. Two extra large batteries kept charged by a generator, and operating a 24-volt motor, provide easy starting with high cranking speeds at all temperatures.

For coal mining a special exhaust gas scrubber can be furnished which not only washes the gases, but cools them to approximately normal temperatures. A test made on this Buda engine showed no trace of carbon monoxide from idling to full rated power.

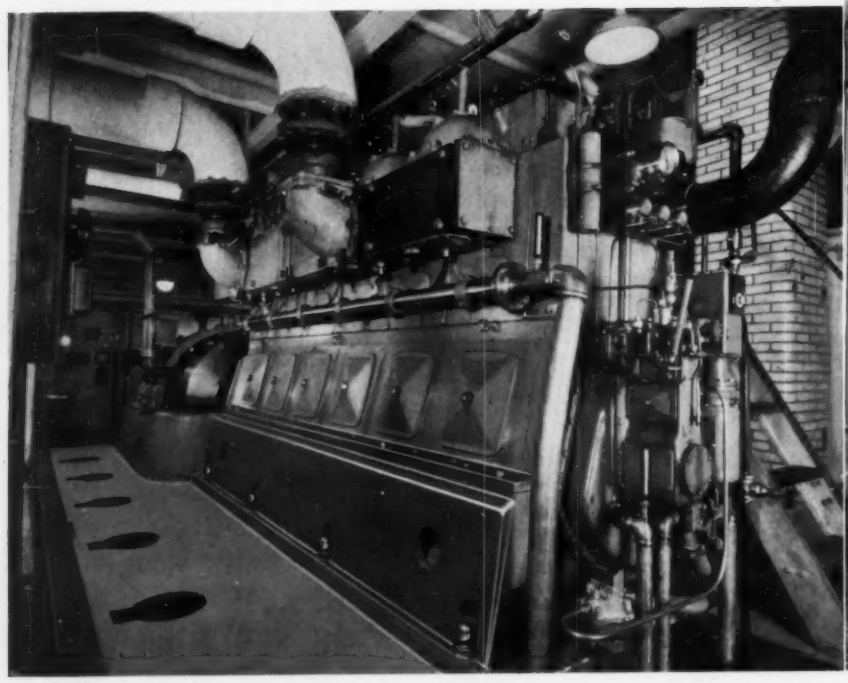


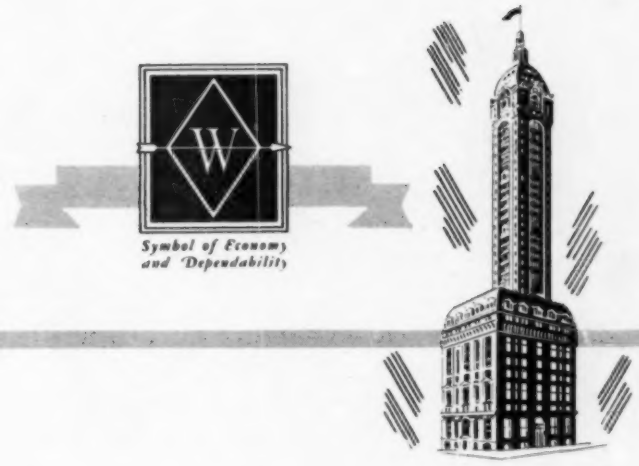
Left: Showing general view of 525 h.p. Winton-Diesel engine in Singer Tower

Below: Showing operating end of Winton-Diesel engine selected for this outstanding installation



Below: Side view of Winton Engine showing spring placement in mounting base





WINTON-DIESEL POWER FOR A *"City Within a City"*

POWER is a vital factor in the economical operation of a modern office building. Load swings are many and varied over a twenty-four hour period. During the day a heavy power load must be available for lights, elevators, heating and electrical equipment. At night and on holidays this load demand diminishes to a minimum. Steam loads are ideally suited to winter seasons but highly inefficient in the summertime because of exhaust waste due to the necessity for maintaining peak-load capacity. Recognizing this fact and realizing that a constantly increasing need for utility break-down service, due to increased load demands, was costing more than it did for their own steam-plant power, the management of the Singer Building investigated the economy possibilities of supplementing their steam facilities with highly efficient Diesel-power. The result . . . today a modern Winton-Diesel engine works "shoulder-to-shoulder" with steam power, giving continuous 24-hour service during the non-heating period of the year and handling over-load demands during the heating season. This outstanding installation consists of a four-cycle, solid injection, six-cylinder, 14" x 16" Winton-Diesel Engine developing 525 b.h.p. at 375 r.p.m. direct connected to a 350 k.w. generator. It exemplifies the marked adaptability of Winton-Diesel power in the solution of the problem of waste-heat recovery, proper vibration isolation and close control. One point of interest connected with this Winton installation, aside from many other features, is its unique spring mounting that serves as a positive means of preventing the transmission of engine vibrations to the building. Since its installation, this Winton-Diesel has given highly satisfactory service and operating figures reveal that it will pay for itself in approximately four years. The September issue of the Winton News completely describes the Singer Building installation . . . we will welcome the opportunity to send a copy to you.

WINTON ENGINE CORPORATION

C L E V E L A N D • O H I O • U. S. A.

DIESEL TRUCKING

By F. HAL HIGGINS

THE Diesel truck has proved itself beyond all question. Nearly 500 units are in use today on the Pacific Coast for long haul freight transportation, four years after the introduction of the first Diesel engined truck. They have met and passed with flying colors the most gruelling tests to which truck engines can be subjected.

Fifteen to twenty-five per cent of the operating costs of gas-engined trucks—yes, and even less. That's what it costs for fuel and lubricating oil to run those Diesel trucks! What would the old-timers of covered wagon days say to that? It used to cost a dollar a ton per mile to haul freight across mountains and desert stretches, according to the old-time drivers of big-hitch horse teams and mule skinners. Stretches over which Diesel trucks now whirl in a few hours took these teams weeks. Times have changed!

Chain store owners, packing houses, live stock raisers, handlers of refinery products, owners of moving vans, motor freight line operators, big and little, sing the praises of the Diesel engine with one accord. Drivers, despatchers and mechanics are ready to tell the world that Diesel trucks have earned their laurels.

President Niven of the Purity Grocery, Inc., of San Francisco can tell the story if anybody can. His firm with a chain of 120 stores scattered up and down the coast for a length of 800 miles, owns 30 trucks and has kept an accurate record of hauling costs as a matter of good business. "Only the present limit of Diesel engine size prevents us from making our entire fleet of trucks one hundred per cent Diesel," said Mr. Niven the other day as he told what Diesels had done to reduce the company's hauling costs. Sixteen of the Purity Grocery's fleet of transport units are Diesel powered.

"Each of these trucks runs on an average from 70,000 to 80,000 miles a year," stated Mr. Niven. "The big six-cylinder Diesel trucks haul a payload of 21 tons on the average. With their trailers they weigh 68,000 pounds gross, which is the legal limit on California highways. These engines give us seven to eight and a half miles per gallon of 4 cent Diesel fuel, as compared with four miles per gallon of 15 cent fuel for the gasoline rigs we had before changing over. Incidentally, all of these sixteen Diesel-motored outfits are change-overs except the two new Kenworths we bought recently. The old trucks are Whites.

"Remember, we started changing to Diesel at the bottom of the depression when business was figuring every change with the greatest of concern. We started in April, 1932, with a single Cummins. Each one we bought after that sold us more on the idea until we reached a 100 per cent possible Dieselization early in 1934. "Advantages of Diesels in our trucks?

"Here's the way I would put them: (1) an 80 per cent fuel saving, (2) one less employee in maintenance with four more vehicles, (3) roadside failures from motor trouble practically eliminated, (4) less frequent valve grinding—one of our Diesels not being 'unbuttoned' in

Neither blazing deserts nor snow-covered mountains with sub-zero weather at 7,000-foot altitudes delay the passage of this Waukesha-Comet Diesel-powered Fageol on its regular run between San Francisco and Salt Lake City.

Cantlay & Tanzola, of Los Angeles, own 21 of these Diesel tank trucks and have just bought five more. Here is one climbing a 30-mile grade.

Purity Stores of San Francisco now own 16 of these big 21-ton Diesel motored freight carriers. They consist of Kenworths and Whites. Each averages 70,000 to 80,000 miles a year.

Shell Petroleum Corporation's tank truck hauling a payload of 3,850 gallons. This new Diesel powered Sterling tractor, with semi-trailer built of special lightweight aluminum alloy, will travel up to 50 mph. Equipped with every modern safety device it is setting records for operating economy.

70,000 miles, (5) better time on the road—hills taken in one to two gears higher, (6) no cylinder heads or blocks cracked from heating, the greatest enemy of internal combustion engines, (7) our drivers are sold on the Diesels—they consider it a demotion to be shifted back to gas power, (8) our radius of operations is increased—instead of two 85-gallon tanks on each truck for the round trip without refueling, we cut 50 gallons off this for Diesels.

. . . . *And now please turn to page 30*

Cotant Truck Lines of San Francisco operate three of these Cummins-Diesel refrigerator trucks over a route to Salt Lake City, Pocatello, Idaho, and return. "We can run four Diesel trucks like this for what it costs to run one gas rig," says J. O. Cotant.

A typical converted Diesel truck, now powered with a Cummins-Diesel and profitably operated by Alfred M. Lewis, Inc., San Diego, California.

LIGHT FOR THE LAMPS OF McMINNVILLE

By VICTORIA CASE

This story, in its original form, appeared recently in the Portland *Sunday Oregonian*. Miss Case, a resident of McMinnville, contributed much of this material to the Sunday supplement of the *Oregonian*.

A 25 PER CENT slash in light and power rates, effective last April 1, told McMinnville residents that there really is a Santa Claus.

Let these facts speak: The McMinnville light and power plant, owned by the people of McMinnville, Ore., is free from debt of any kind, either bonded or current. It operated last year with a surplus amounting to almost 30 per cent. It is valued at approximately $500,000, which gives each McMinnville resident a standing as a capitalist. It has "loaned" $60,000 or more from its profits to the water department, which is under the same commission, serving the same people.

Facts concerning the McMinnville plant, contained here, are furnished by Milton H. McGuire, superintendent of the light department since 1920 and manager of both light and water departments since 1927.

Most of the success of the McMinnville system is due to the vast amount of unselfish public service given by the water and light commission members. The commission consists of four members, appointed by the mayor with the approval of the city council. Each is appointed for four years and serves without pay.

The length of time served by each present member of the commission indicates that the group is practically untouched by local politics. Walter S. Link has served for 22 years, Dr. H. L. Toney for 16 years, Dr. William Dielschneider for 17 years and Gilbert Tilbury for ten years. Mayor Oscar Chenowith is an ex-officio member of the commission.

Another large factor in the success of the light system is the use of Diesels instead of steam in manufacturing electricity. McMinnville has the largest installation of Diesel engines in the Pacific northwest. Until a year ago it had the largest plant west of the Rockies, but a plant installed in the city of Vernon, Cal., is larger.

M. H. McGuire, manager McMinnville light and water departments.

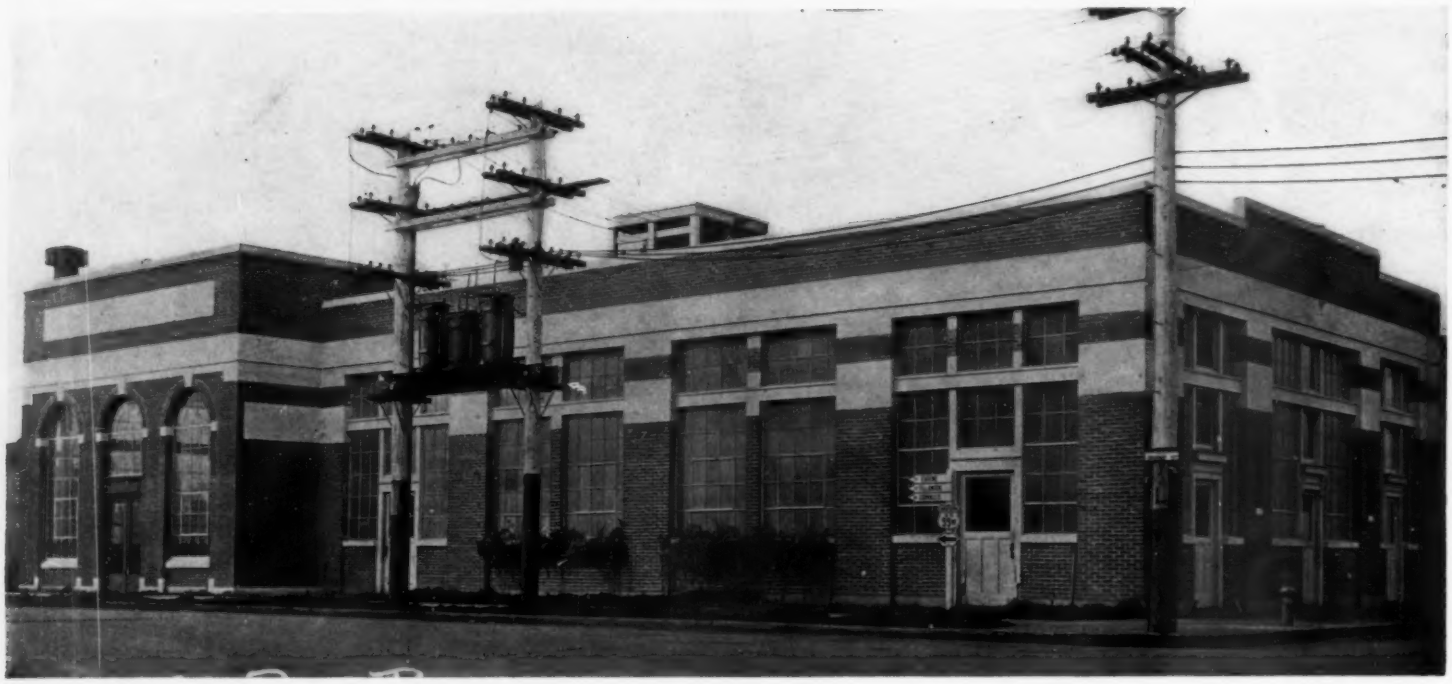
In 1920 the picture was not so rosy as it is today. The light department was then losing up to $3,000 a month, had an overdraft of $40,000 at the banks and owed bonds totaling $75,000, some of them dating from 1888 when the plant was first installed. Moreover, the plant was badly in need of new equipment.

The city was using a steam plant with water power on Baker creek, about eight miles from McMinnville.

This plant is still in running order. At that time the Baker creek plant was the only one. It used what water power it could and finished the job with steam. Wood was the necessary fuel, and after cutting all of the city-owned wood and buying all the cheap wood available nearby the commission found that prices of both wood and labor were rising out of reason.

A unique remedy was sought for this situation in the use of convict labor to cut wood. From that summer the department began to show a profit and it has consistently operated at a profit every year since that time.

After the difficult experiences which culminated in the employment of convict labor, the commission was ready to consider Diesel engines to cut the costs of operation, make a more dependable plant and increase production. The



first two Diesel units were installed in 1924 in a new building near the center of the city. The installation cost $61,000 and was financed by bonds. Each unit had a capacity of 200 kw. and were Fairbanks-Morse Diesels.

Immediately the new plant began to keep ahead of demands made on it by the growing city and to cut costs to an almost unbelievably low figure. Inside of 21 months the bonds, overdrafts and back debts had been cleared off. Some bonds had been bearing interest 36 years.

As soon as the plant was free of debt rates were cut. Then the demand became heavier and an additional unit was needed in 1926. A loan of $50,000 was negotiated at the local banks and the third unit of 600 hp. provided a Busch-Sulzer Diesel. This loan was paid in less than two years. Rates were cut again.

Again in 1930 the demand outgrew the capacity of the plant and additional machinery had to be installed. The new installation cost $120,000 and attracted the attention of engineers all over the United States. Mr. McGuire went to the Busch-Sulzer plant in St. Louis to superintend the testing of the new unit, a big 1,500 hp. Diesel.

The loan of $100,000, which permitted payment of cash for the new equipment, was repaid by the fall of 1933.

In less than ten years of Diesel operation the plant made an amazing record. It paid off old debts of $115,000, retired new debts totaling $150,000 and bought for cash new equipment and parts amounting to $147,652.60.

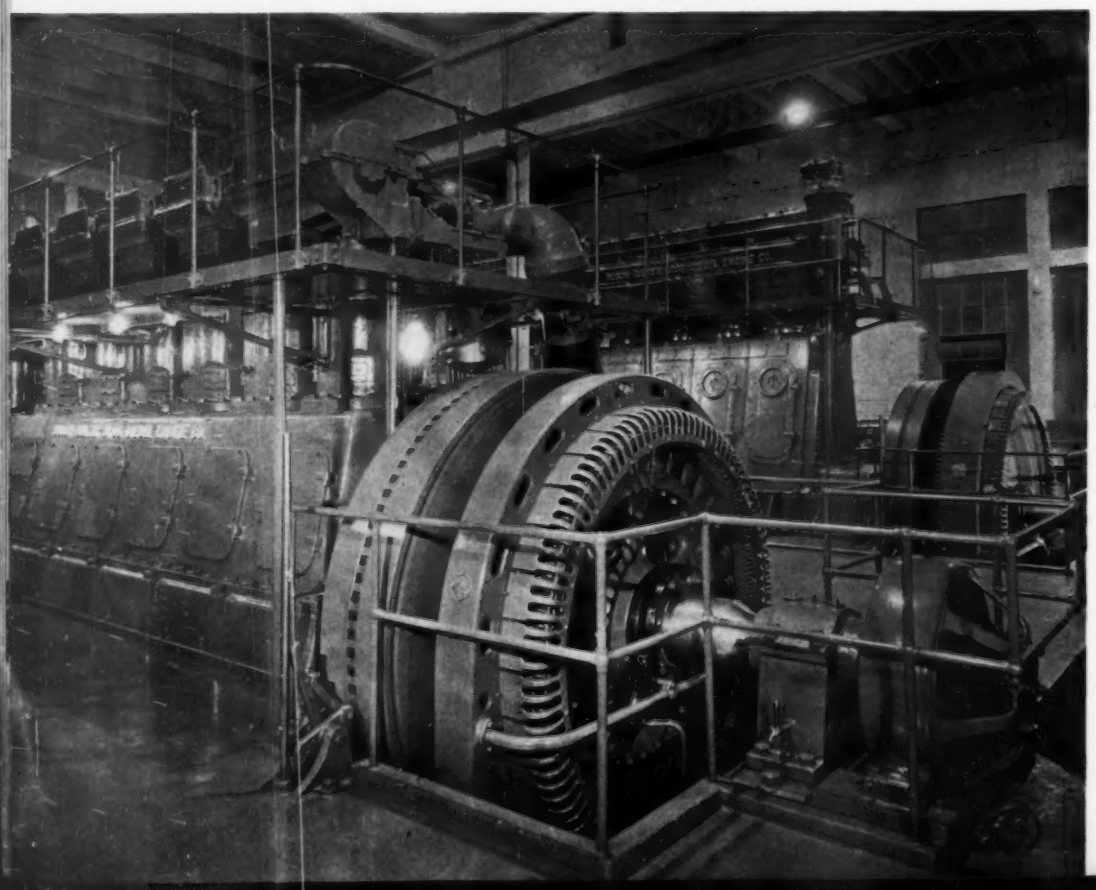
From being practically bankrupt in 1924, its debts amounting to almost the total value of its equipment, the plant in 1933 was all clear, in first-class shape and worth about $500,000.

Rate cuts between 1920 and 1933 amounted to 33 per cent. The last rate cut, announced for April 1 of this year, was an additional 25 per cent on residence light, heat and small power (single meter); 20 per cent on residence cooking, heating and small power (two meters); 20 per cent on water heaters and from 15 to 20 per cent on commercial heating.

Specifically the rates are: Residence light, heat and small power (single meter), first 30 kwh. at 6 cents, balance at 2 cents. Residence cooking, heating and small power (two meters),

In the foreground is the 600 hp. Busch-Sulzer Diesel engine. In the rear is the 1,500 hp. unit.

All plant photographs used in this article were supplied through the courtesy of the Texas Company. All but the photograph at the top of page 23 were made by the well-known Pacific photographer, Orville Logan Snider.



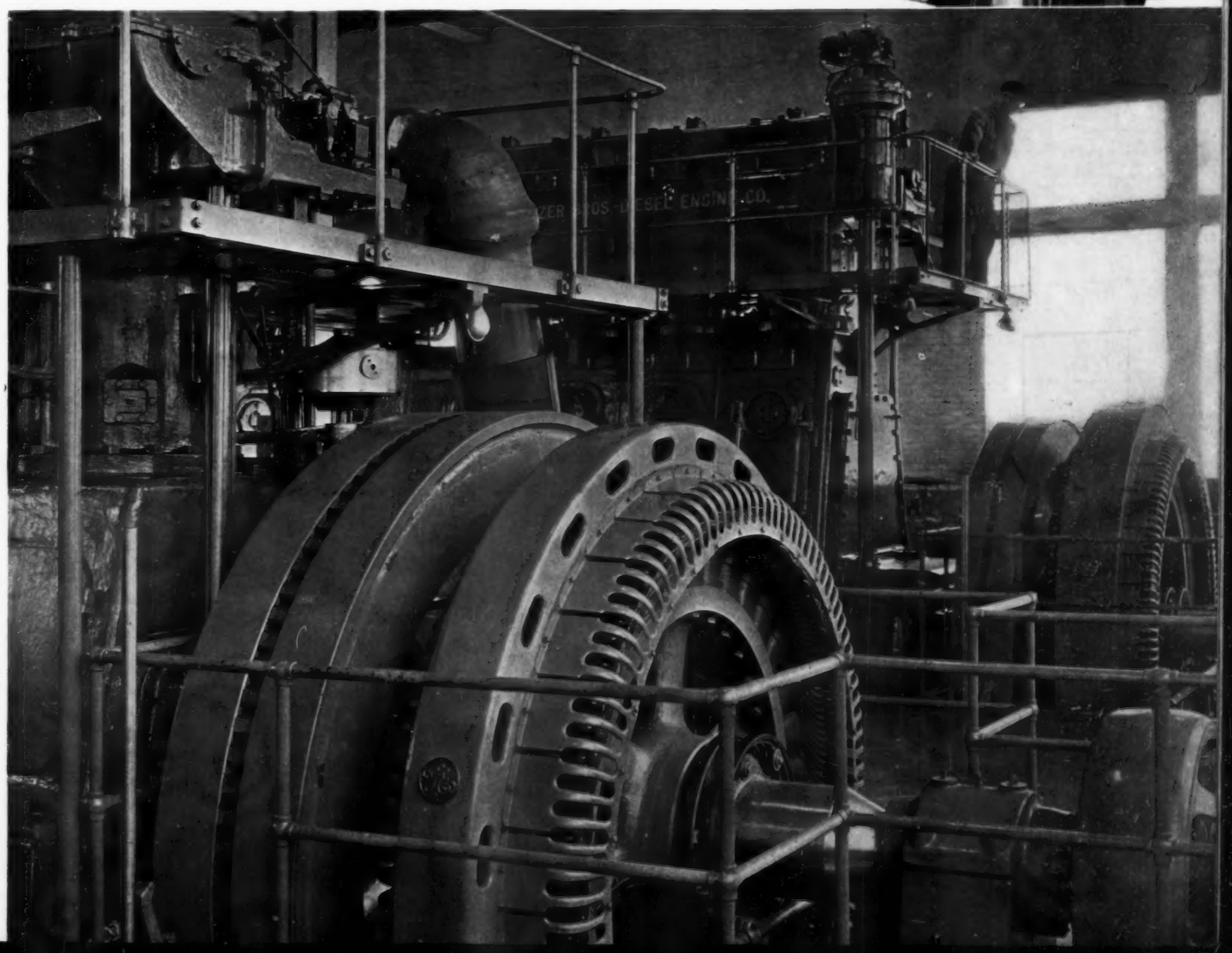
2 cents per kwh. Water heater (750 watt), flat rate $2.75 per month.

The recently published figures of the federal power commission provide an indication of the manner in which McMinnville's rates compare with other Oregon communities. These figures, taken from the commission's list, are selected from scattered points throughout the state:

	25 kwh.	100 kwh.	250 kwh.
Portland	$1.38	$3.39	$6.09
Salem	1.38	3.39	6.09
Eugene	1.35	3.10	5.72
Klamath Falls	2.00	6.50	7.25
Medford	2.00	6.50	7.25
Baker	2.25	5.00	8.75
La Grande	2.25	5.00	8.75
Newberg	1.62	3.87	7.28
McMinnville	1.50	3.20	6.20
Burns	3.00	8.00	11.75
Reedsport	4.00	9.10	10.75

. . . . *And now please turn to page 33*

Right — General interior view of the McMinnville municipal plant. Below—A close-up of the big generators that help make McMinnville one of the best lighted cities in Oregon.

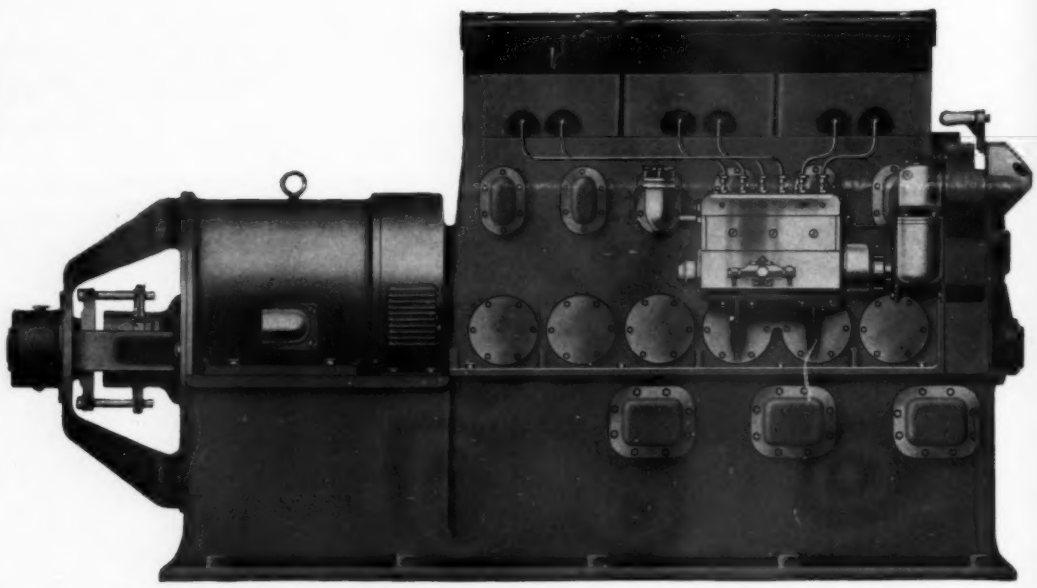


NIGHT AND DAY WITH DIESELS

BUSINESS is good with the American Garage, Inc., of New Brunswick, N. J., located on Route 25, one of New Jersey's busiest highways. Since its proprietors installed a new 50 kw. Diesel-driven lighting plant last June, doubling the station's former wattage, *sales have jumped more than 40 per cent.* Paradoxically, *lighting costs have been reduced more than one-half!*

Formerly lighting current was generated by a home-made outfit consisting of a 50 hp. gasoline engine coupled to a 20 hp. d.c. generator. It burned nightly 30 gallons of gas at a cost of $4.20, to generate enough current to furnish lights consuming a total of 13,000 watts. At this rate the filling station's lighting bill was $126.00 a month. That was quite an item.

The new lighting plant consisting of a Superior six cylinder Diesel power unit developing 85 hp. at 1,600 rpm., direct connected to a 50 kw. Crocker-Wheeler a.c. generator with a 30 per cent increase in load, uses only 33 gallons of No. 2 fuel oil @ 5½ cents a gallon, and



The six-cylinder Superior 4½"x5¾" Diesel engine direct connected to the 50 kw. Crocker Wheeler generator, which enables American Garage, Inc., to use twice its former wattage at half the previous cost.

costs but $1.82 to operate nightly. The monthly fuel cost now totals only $54.60.

Subtracting this sum from $126.00 a month—what it used to cost with the former gasoline-driven generating set—it shows a clear saving of $71.40 a month in fuel costs alone, while lubricating oil consumption is almost negligible. The former gas-driven set was extravagant with oil. The Diesel is just the opposite, consuming only about two quarts in a 150-hour period, at the end of which the oil is changed.

Yet with this reduction of over $71.40 a month in fuel and lubricating oil costs, the consumption of current has jumped to 25,000 watts—nearly double the previous wattage.

A similar Superior Diesel engine, manufactured by the Otto Engine Works division of the National Superior Company, and installed in the yacht *Aldoma*, was described in last month's issue. It has a bore of 4½ inches, stroke 5¾ inches, and a cylinder displacement of 548.7 cubic inches. These units are also built in two and four-cylinder sizes and are of the four-cycle, cold-starting, solid-injection type.

The Diesel generating set runs from sunset to sunrise for a longer period of time than the former gas generating set and furnishes electricity for all lamps, neon signs and pump lights for the stations on each side of the road. Housed in a small concrete block structure formerly occupied by the gasoline-driven generator, located immediately in the rear of the main filling station, the outfit was installed at comparatively little expense. A cooling tower 6′ x 30″ with six spray nozzles, and with a temperature range from 143 down to 105 degrees, was built on the roof of the structure. The engine exhaust was piped down through the floor and out of the side of the building into a 55-gallon oil drum buried three feet in the ground. From this homemade exhaust chamber a three-inch standpipe was connected and led up to the roof. The exhaust is barely audible a few feet away. The installation has a neat and workmanlike appearance.

The work was done by Simon Epstein and his three sons who are associated in the business with him, together with Vincent T. Elliott, a local electrician, who supervised all the electrical work. A two-inch conduit, laid when the new road was built, carries wires under the concrete highway to the company's other filling station located on the opposite side.

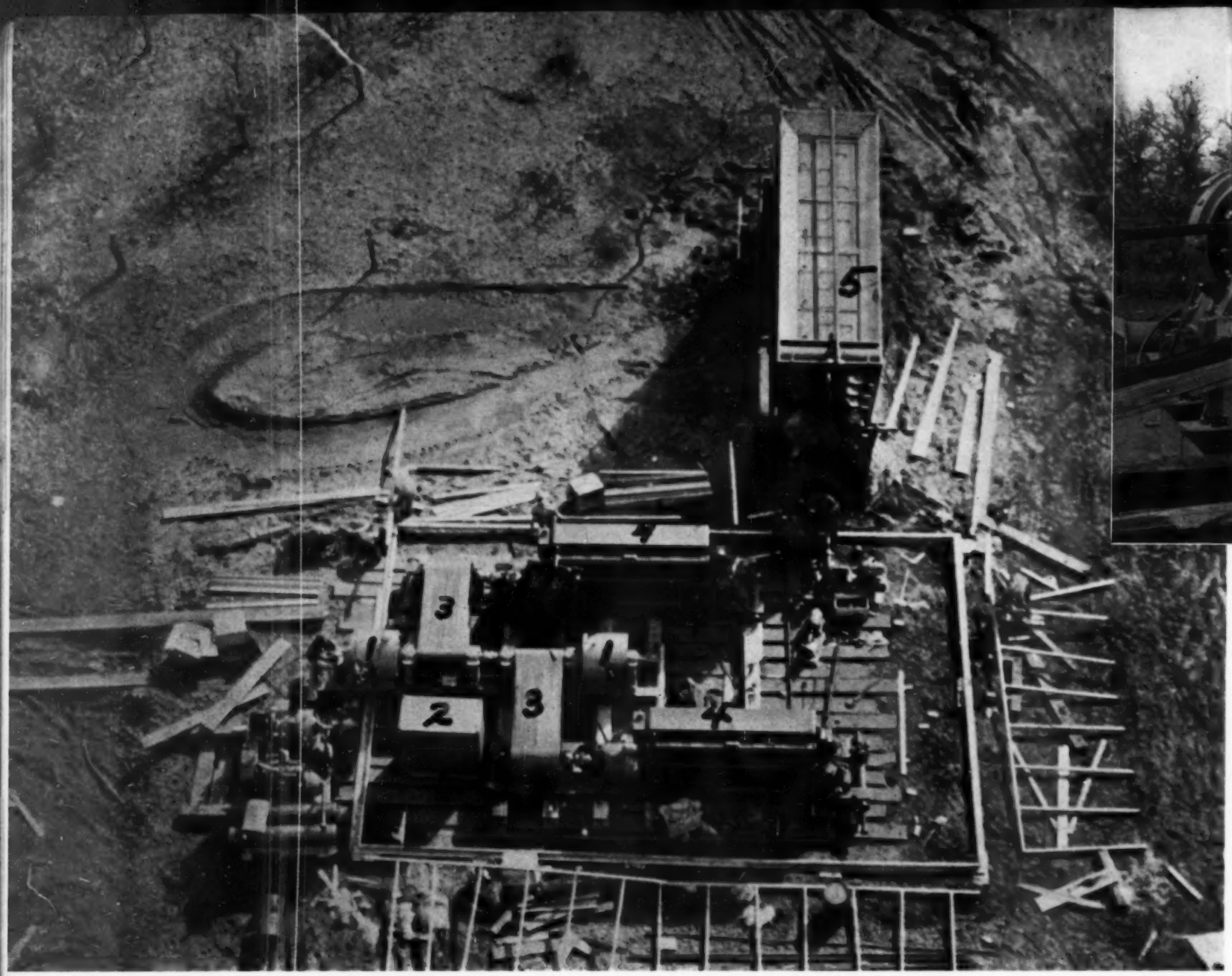
The set has a generating capacity twice the present needs of the filling station, even with its doubled wattage, but arrangements have been made to supply part of the present surplus to an adjoining roadside diner, whose owner plans to hook on to the set instead of continuing to used purchased current.

Electric starting is provided on all of the new Superior Diesel generating sets, and provision is made for compression release to enable the engine to be cranked rapidly before compression is applied. The set employs a 24-volt starter system and starting is by battery. A push of the lever starts the Diesel instantly—much easier, in fact, than the former gasoline-driven set which was often difficult to start. Starting is easy at all temperatures.

The American Garage has been established five years now and in that period has built up its gas sales to 2,000 gallons a day. Besides gas, oil, tires and accessories, it also sells Diesel fuel.

"If the amount of light which our Diesel generates at present were to be purchased from the local power company, our bill for the month would be approximately $350," says Frank Epstein, who manages the station.

Diesel-generated light has brought prosperity to the American Garage. Its light bills each month now are *light* bills indeed.



DIESELS AND "WILDCATS"

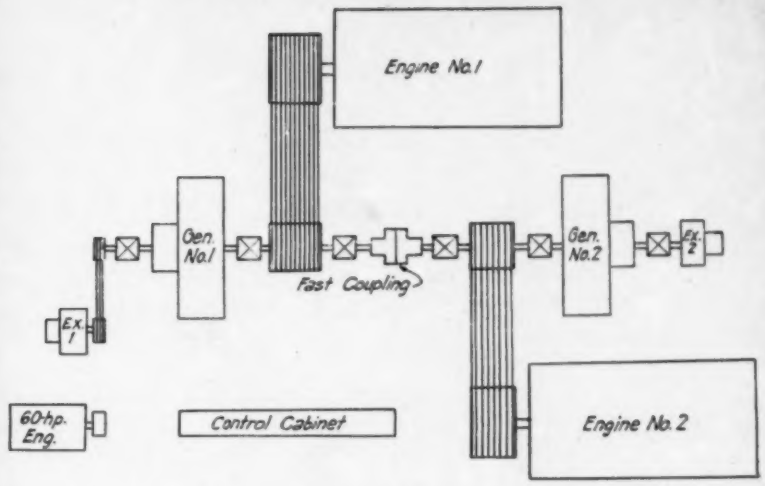
By W. C. LANE

(Through the courtesy of Petroleum Engineer)

WILDCAT wells always attract attention by reason of the uncertainty existing regarding what may be found a mile or so below the surface of the earth. To the public, Gypsy Oil Company's well, Schock 1, about four miles north of Edmond, Oklahoma County, Okla., is just another test but to those directly concerned with the mechanics of drilling and the machinery used, it is attracting more than the usual amount of attention by reason of the use of Diesel-electric power. The well was spudded last March 17, but because the conductor pipe stuck the crew was delayed in getting started. Work is now progressing at a satisfactory rate and at the time this was written a depth of 4,100 feet had been reached.

The variable voltage system of speed control used is an old one but it is always interesting to see a new application of an old principle and to study the adaptations made. The application is new in that it is the first time electrical machinery of this particular rating has been used on a drilling well. The motors used to operate the drawworks, slush pumps, and the auxiliaries are supplied with d.c. energy from a portable Diesel engine-driven generating plant. With the exception of the power plant, motors, and a few special auxiliaries, the machinery in use is of standard types such as may be seen in any other petroleum field of an equivalent depth.

The rig is the property of the Parker Drilling Company of Tulsa, Okla., and is an outfit that may be used to advantage for drilling in any proven field, but it appears to be especially adaptable to wildcat work. About ten barrels of oil constitutes an ample daily fuel supply and the only clean water required is one barrel a day to replace that lost by leakage from the cooling system. Surface water of any quality may be used in the slush pits and for the spray tower. To these outstanding



Schematic drawing showing floor plan of the generating plant which has a variable voltage system of speed control.

The rig viewed from above showing (1) Generators, (2) Control cubicle (3) V-belt drive, (4) Diesel engines, (5) Cooling tower. (Above) One of the generators.

advantages are added the flexibility, reliability, and high efficiency of the d.c. drive.

Two Superior 8-cylinder 9″ x 12″ Diesel engines, one rated at 300 hp. at 514 rpm. and the other at 350 hp. at 600 rpm., insure an abundance of power without resorting to racing the engines. Each engine, with its clutch, is mounted on a substantial steel base, which rests on a mat of timbers supported by an earthen foundation. It is believed that a dry earthen foundation when prepared and protected with proper care is all that is needed to support the engines. The weight of each assembly is 23,500 pounds.

The electrical power plant includes two 175-kw., 200-volt, 1,200 rpm. differentially wound, separately excited, d.c. Westinghouse generators and an exciter, mounted on a common steel base. The generators are of the open, pedestal type and provisions have been made for driving an exciter from a front extension of the shaft of each. The arrangement of the unit is given in the sketch of the plant layout shown herewith. The total weight of the two generators, one exciter, and the drives as mounted is about 20,000 pounds.

With the exception of the two master drum controllers and a small sequence controller, all major control items constituting the control for the rig are mounted in a steel cubicle. When the output of the two generators is to be combined for hoisting work the control is so arranged that the generators are connected in series. Under full-load conditions the drawworks motor will be subjected to 400 volts and at light loads probably 500 volts. This overvoltage is advantageous in that it gives the motor a correspondingly high light-load speed and thus decreases the time required to hoist the empty elevator while handling pipe.

Current from the exciter is used to excite the fields of the two main generators, the fields of the drawworks, and the pump motors and to drive the blowers that keep them cool. Also to drive the wash down pump, the raw water pump on the spray tower, to light the rig, and to actuate the contactors on the control panel and the relays that do so many uncanny things.

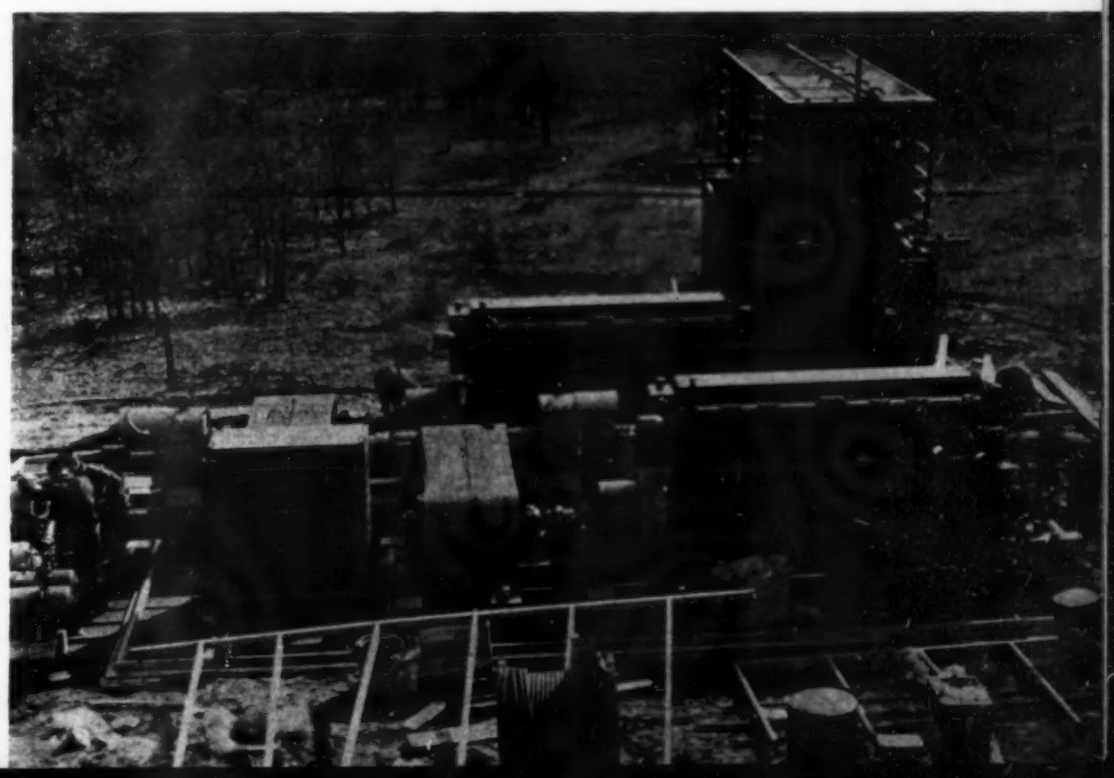
A 500-barrel storage tank has been provided to insure the rig against any possible fuel shortage. This enables the fuel contractor to select periods of dry weather when the roads are good for replenishing the oil supply. The regular Diesel fuel oil used in the engines costs delivered, approximately $1.78 a barrel.

The power from the drilling and hoisting motor is applied to the drawworks through the medium of a 3.25 to 1 herringbone speed reducer and a chain drive. A standard 3-speed drawworks, of the unit type such as is in common use, makes available a wide range of rope and rotary speeds.

The rig includes two 7¼″ x 14″ slush pumps each driven by a 200 hp., 900 rpm., 200 volt motor. These motors are said to have a large overload capacity and, like the drawworks motor, each is provided with a blower, mounted on the top of the yoke.

The high efficiency of the rig is based on the general principle that all the output of the generators is utilized. This is because a variable speed can be imparted to the motors without any energy being dissipated in control resistance grids as in the case of variable speed alternating current motors.

A general view of the power plant.



DIESEL TRUCKING

. . . . *Continued from page 22* . . . .

"Yes, we did test runs of gasoline and Diesel trucks over our routes for a time, comparing four gasoline motored trucks against four Diesel motored trucks. Here's the table covering these routes for a 48-week period:

	GASOLINE (for 248,000 miles)	DIESEL (for 238,000 miles)
Fuel Costs	$7429.00	$1194.00
Lubricating Oil	723.00	670.00
TOTAL	$8152.00	$1864.00

"Disadvantages? None, whatsoever; in fact, we're waiting for the manufacturers to bring down the Diesel engine to smaller sizes so we can use them in our smaller trucks, too."

The Safeway Stores, Inc., another chain, has a similar story to tell about Diesels. To date they have five Diesel trucks running out of Los Angeles. Though with only four months of ownership, and with mileage and time records not nearly so conclusive as the data gathered by the Purity Grocery organization, their report is highly encouraging. "We save $10 a day per truck," declares O. A. Tucker, manager of transportation. "Diesels are better on the hot runs. Gas and oil costs have dropped from 5 cents to 1.2 cents per mile.

But among the really big fleets like Pacific Freight Lines, Inc., with headquarters at Los Angeles, operating 73 Diesel trucks running out of Los Angeles to cities in Arizona, Salt Lake City, San Francisco and various points in between, more tangible results can be gleaned from records that cover millions of truck miles during the last three years. Pacific Freight Lines officials figure a saving of 2.78 cents per mile, amounting to $2780.00 a year per truck at the rate of 100,000 miles per truck. Its fleet comprises large trucks powered with six-cylinder engines, drawing trailers, as well as smaller trucks powered with four-cylinder engines. As these trucks do a lot of pick-up work around town, perhaps this estimated saving is a bit too optimistic for the entire fleet.

Cantlay & Tanzola, whose headquarters are just across the street from Pacific Freight Lines, now own 21 Diesel powered trucks and do a heavy tank freighting business out of Los Angeles. Mr. Cantlay, president of the company, was not talking for publication when he was interviewed last May, on account of a session of the state legislature that threatened to slap a five-cent tax on Diesel fuel. However, he did go so far as to say he "would buy nothing but Diesel powered trucks for long haul freighting." When one learns that gasoline is now hauled over the road from Los Angeles to Phoenix, Arizona, at a cost of two cents a gallon compared with five cents a gallon when it was hauled by gas engined trucks, you get an idea of what Diesels mean today in freighting.

Consolidated Freight Lines, Inc., whose headquarters are at Portland, Oregon, is the second largest Diesel truck fleet owner on the Pacific coast with 52 now in daily operation. It has branches located at Seattle, San Francisco and Salt Lake City. Its big, dark green trucks with their red-striped trailers are frequent sights to those traveling the main arteries connecting these cities. "We changed over to Diesel from the best gasoline truck engines built," explained the despatcher in Consolidated's San Francisco office. "We can maintain our schedules over mountains and through desert country in summer and winter much better with Diesels. Schedules are not only more certain but have been cut to less time on the road. Result: fewer accidents because of fresher drivers and less clogging of traffic on the highways going up hills. Less tire wear is also an item with Diesels, as there's less gear shifting."

"There is no doubt at all that the Diesel is the motor to use," says J. G. Jones, head of the Jones Transportation fleet, San Luis, Obispo, California, owner of four Diesel powered trucks now operating up and down the coast from that city. "Diesel truck No. 1 has gone 200,000 miles now. No. 2 has gone 150,000. No. 3, 100,000 miles, and No. 4, 50,000," he says. "I bought my first Diesel in December, 1932, and the others six months apart. Each one sold me more and more on Diesel engine power for trucking over long hauls." That statement tells the story. Most sales are repeat sales. Fleets are built up as the result of a single change-over from gas to Diesel.

Two other of the smaller concerns running schedules out of San Francisco to Salt Lake City, Pocatello, Boise City and points between are the J. O. Cotant Truck Lines, and Utah-California Motor Lines, with three and five Diesel powered trucks, respectively, making about the same runs and using the two leading Diesel engines. The service given by Diesels is the deciding factor with Utah-California Motor lines, according to the head mechanic. Both companies agree that the Diesel, besides saving fuel costs, also saves tires. One of Cotant's Kenworth trucks is wearing the original set of tires at the end of 49,000 miles with little apparent signs of wear. "Better than gas. More drag," said Albert Cotant, brother of the head of the firm, at the finish of his first run with a Diesel. "It's especially nice to start on cold mornings in high altitudes."

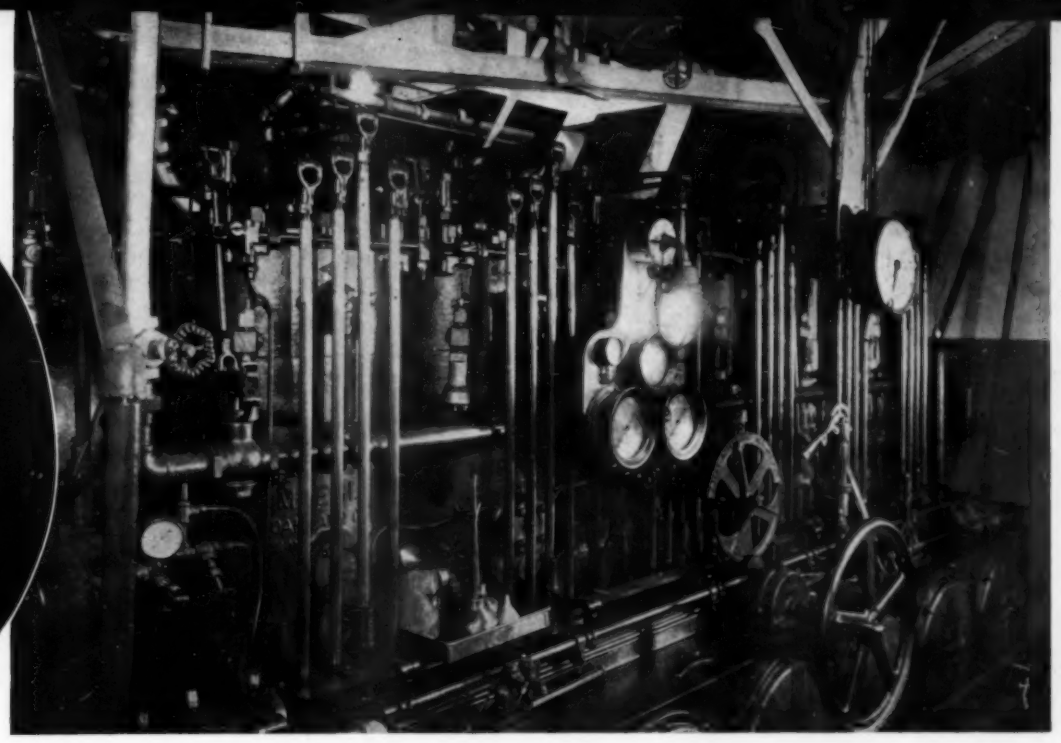
Two other industries included in this check-up of Diesel truck operators are a milk company and a brick manufacturer. The former is the largest dairy products distributor on the Coast, the Golden State Milk Company, Ltd. This company owns one truck that makes a daily cream pick-up over a 300-mile run. Their answer as the second year of Diesel truck usage draws to an end lists the following advantages:

(1) Lower fuel costs.
(2) Safer on the highways.
(3) Faster on grades.
(4) Less wear on tires.
(5) Easier to maintain schedules.
(6) Longer life for the truck.
(7) Operators like the Diesels better.
(8) Easier to start in all kinds of weather.
(9) Less time on the road—more working time for men and equipment.

The Lang Transportation Corporation, Los Angeles, owner of 21 Diesel powered tank trucks, is the Coast's leading trucker of oil field products. Their trucks consist chiefly of Macks, changed over from gasoline. Says its vice-president, Howard M. Lang: "I believe that for long haul transport service the Diesel is the answer. We purchased our first Diesel engine in September 1933, and have a top mileage on them of 120,000 miles."

Four Pacific coast truck manufacturers are now building models with Diesel engines as standard equipment, or optional to suit the buyer. These manufacturers are Kenworth at Seattle, Kleiber at San Francisco, Fageol, across the bay in Oakland, and Moreland in Los Angeles.

EDITOR'S NOTE: So far as it is possible to ascertain there are at least 800 Diesel powered trucks now in operation throughout the United States and the number is growing daily. Though the movement gained its initial impetus in the west, eastern trucking operators were quick to see the advantages. As a result orders for new Diesel trucks, as well as for new Diesel engines to replace gasoline engines in trucks now being operated, are pouring in from every quarter. The November issue of Diesel Progress *will present further proof of this rapidly spreading Dieselization of highway transportation.*



"DIESELS ARE PARAMOUNT"

—Says BERT REINAUER

ON March 30, 1934, a lone craft bucked and pushed its way through solid sheets of ice up the Hudson River and won the distinction of being the first boat to reach Albany that year. Next morning's newspapers carried a feature story on the event as covered by a reporter who witnessed the vessel's victorious battle.

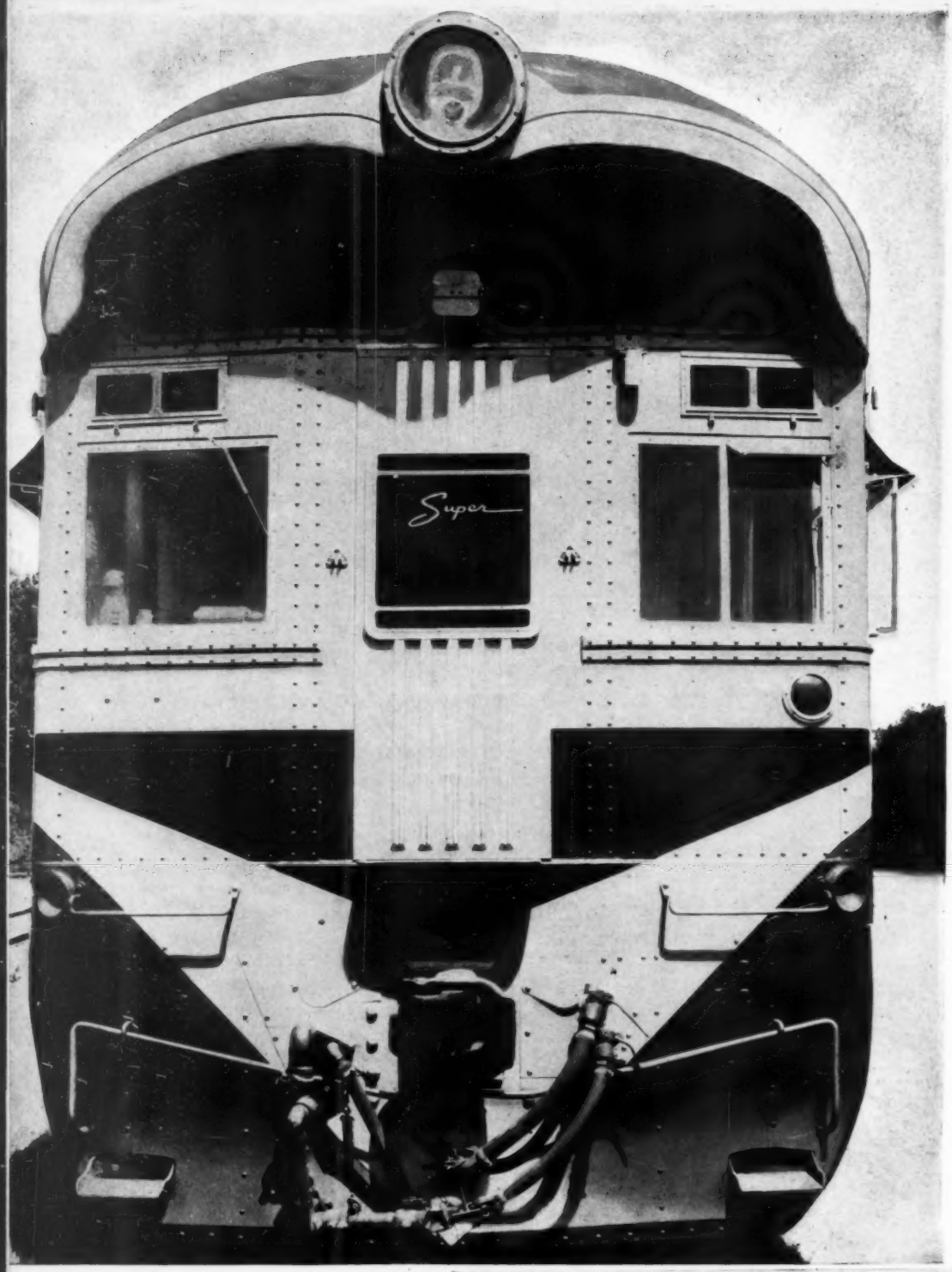
The hero of this story was the Diesel motored tanker, R T C No. 10, owned by the Reinauer Transportation Companies of Lyndhurst, New Jersey, operators of a fleet of eleven tankers and one of the largest independent carriers of bulk petroleum products in the United States.

Tanker R T C No. 10 acquired by the Reinauer organization nearly three years ago, was formerly the "General Timothy Pickering" of the U. S. Army Quartermaster Corps. Built at Philadelphia in 1905, she was powered at the time of her purchase with a 600 hp. compound steam engine. To continue to operate her with steam after being converted to a tankship would have been expensive, decided Bert Reinauer, head of the operating department, so the first thing he did was order her to be Dieselized. On March 27, 1933, she was placed in the company's service powered with a heavy duty, six cylinder 11½" x 15" Atlas Imperial Diesel engine developing 275 hp. at 275 rpm. Since that date, operating night and day, the engine has given continuous, uninterrupted service. The engine has never been taken down, states Mr. Reinauer.

The craft is 110 feet long, has a beam of 24.4 feet and, fully loaded, draws 13.2 feet of water. She has a capacity of 110,000 gallons, and despite her heavy displacement can be driven at an average speed of between 10½ and 11 knots. Using No. 2 fuel oil at five cents a gallon her engine consumes only 15 to 16 gallons an hour at this speed. Her lubricating oil consumption is placed at 2,000 hp. hours per gallon. Of the nine other tankers in the Reinauer fleet her lubrication cost is the lowest, claim the engineers.

She carries a crew of seven—a captain and a first officer, two engineers, two seamen and a cook. Using steam, the Reinauer Company estimates that she would require a crew of eleven, to which cost would have to be added standby losses when she was at dock. She loads cargoes at Bayonne and Cartaret, New Jersey.

. . . . *And now please turn to page 34*

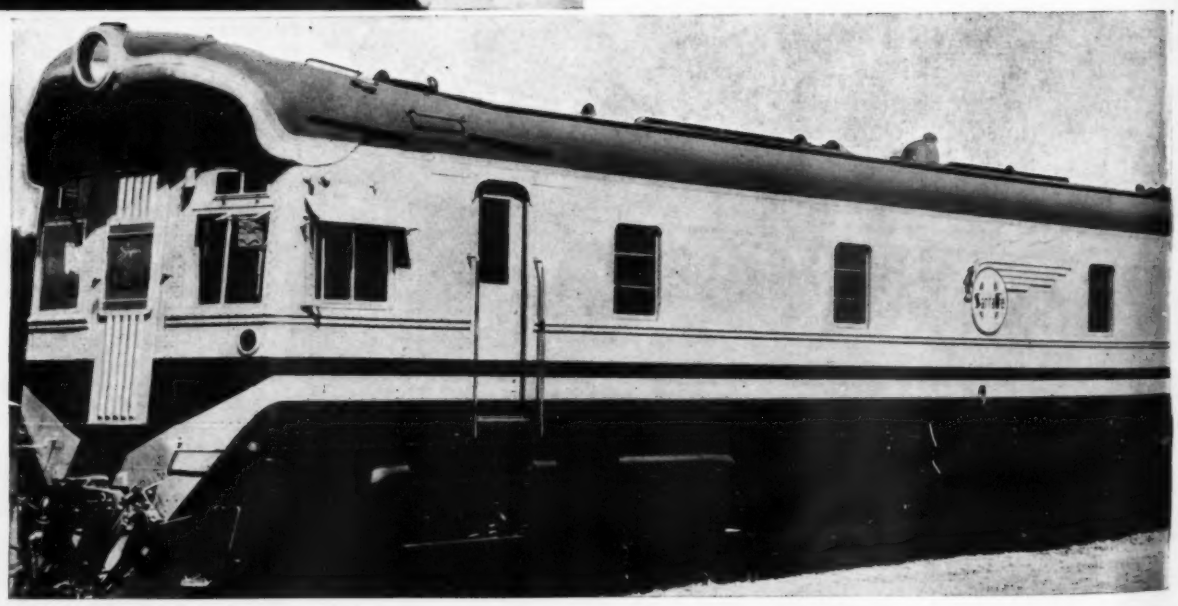


SUPER CHIEF — appropriately named — will haul the famous extra fare Sante Fe train from Chicago to Los Angeles without an engine change, demarking a new era in railroad transportation.

The first main line Diesel locomotive to go into service, the SUPER CHIEF is powered with four 900 hp. V12-cylinder Winton Diesel Engines. The most powerful Diesel locomotive in the world.

It is but logical that the crankshafts for the four main engines and for the auxiliary Winton engines on the SUPER CHIEF should come from the Erie Forge Company, who manufacture a majority of the Diesel engine crankshafts.

Not only today, but for many years past, in fact, since the inception of the Diesel engine use in this country, the leading engine manufacturers have relied on us for their crankshafts.



ERIE FORGE COMPANY

ERIE PENNSYLVANIA

LIGHT FOR THE LAMPS OF McMINNVILLE

. . . . *Continued from page 25* . . . .

The McMinnville figures have been corrected to include the recent rate reduction. This reduction was not included in the commission's figures.

These rates can easily be compared with those on the bill received monthly by consumers in every Oregon city. McMinnville rates compare favorably with those in effect in other Oregon towns. Eugene, with its municipal plant, is slightly lower than McMinnville.

The McMinnville plant has several advantages which are translated into convenience and profit for the rate payers. It is located near the center of the city and does not require power lines with their high cost and upkeep to carry the load in from distant points; it is using cheap fuel; it can go into full capacity inside of ten minutes.

An interesting sidelight on Diesel engine maintenance is revealed by Mr. McGuire in his almost fanatical insistence on immaculate conditions around the power plant. When an attendant finds a screw loose or a part ready to give he repairs or replaces it right there. The engines are always at the top of their form.

The McMinnville plant has been lacking in those periods of darkness which surprise residents in less-fortunate cities. The lights do not blink out in the middle of a party or go A.W.O.L. while the Thanksgiving turkey is cooking in the electric oven.

Bonneville Dam may inject a new element into the future of municipal power systems. Under the huge new project power lines may bring unlimited power at a still unpredictable rate to the very doors of McMinnville.

"What about McMinnville's half million investment?" Mr. McGuire is asked many times. "If the power comes from Bonneville, what good is the light plant going to do us?" Mr. McGuire smiles happily when such questions are raised. He has thought the problem through and sees nothing but advantage ahead of the city plant.

In the first place, he figures, each community will require a system of distribution. Bonneville power will come to the city limits and some local organization must buy the power, deliver it to the homes, collect bills and handle the thousand details of installation. This local distributing system may be either private or municipal. In McMinnville it will be municipal, as the present commission will simply continue to function with equipment now in use and not a cent of additional expense.

The second point is the fact that standby units will be needed all over the territory. If a break comes in the hundreds of miles of power lines leading from the Bonneville power plant certain plants scattered over the valley must be ready to give emergency service.

McMinnville, with its Diesel units, will be ideally situated to give such standby service. Its engines can be thrown into full capacity in less than ten minutes, even when the plant is entirely shut down and has been out of service for an indefinite period. The present equipment can last for a long time.

Presumably in choosing its standby units the government might be expected to favor an arm of itself, so to speak, and give preference to a municipally owned plant. Naturally the pay municipally owned plant.

Therefore, if the Bonneville power plans work out as expected, well and good. McMinnville will offer service and be ready to realize an ad- higher than the cost of running the municipal plant at McMinnville, the plant will simply continue to operate. Either way, McMinnville is in an enviable position with regard to its light and power.

Save Money and Engine With

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BECAUSE of the excessively large filtering area per floor space occupied. Eliminates frequent cleaning.

BECAUSE they have no moving parts to replace and repair.

BECAUSE the initial cost per square inch of filtering area is many times less than any other filter made.

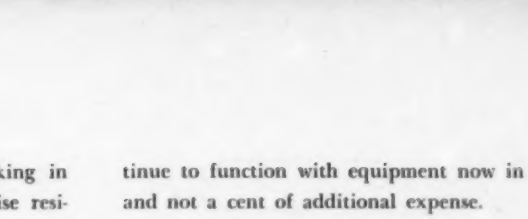
BECAUSE the extraction of erosives, carbon and non-precipitating substances is accomplished by the only successful method known to science and practice, and is being demonstrated by the many replacements of other makes of so-called filters.

BECAUSE they will produce 99 8/10% clean oil.

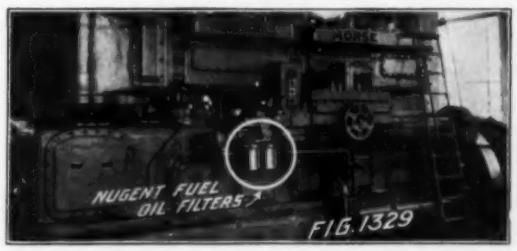
For filtering
Fuel Oil
Lubricating Oil
Olive Oil
Peanut Oil
Soy Bean Oil
Lotions
etc., etc.

The oil is the only thing that moves in a Nugent Oil Filter

There is a Nugent Filter for your requirements in any size for Fuel or Lubricating Oil up to 8,000 gph. Let the nearest Nugent filter specialist help you choose filters or call the nearest sales office for a demonstration. If you do not have literature further describing our Filters, Oiling Systems and Appliances, write us for it.



Seven Nugent Lubricating Oil Filters on seven Ingersoll-Rand Diesel Electric Locomotives. Each filter has 3,780 square inches of filtering area and occupying only 2,180 cubic inches of space.



Nugent Duplex Fuel Oil Filter on Fairbanks-Morse Diesel Engine.

Wm. W. Nugent & Co., Inc. Mfrs.
Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices.
Sight Feed Valves, Flow Indicators, Compression Union Fittings, Oil Pumps, Etc.
415 N. Hermitage Ave. Established 1897 Chicago, U. S. A.

BIG JO HALVES POWER BILL

. . . . *Continued from page 15* . . . .

mill in operation at night, the 630 hp. engine would be used for night, and the 140 hp. would be shut down. As this mill operates on a five-day week, there would be periods when only the elevator would be used and the 140 hp. unit could take care of this load nicely.

It was estimated that the power costs for Diesel would run approximately .55c per kwhr. on an average consumption of 2,000,000 kwhr. per year. The figures tabulated on page 15 give the answer. Even though the mill was operated on reduced capacity during the first nine months of operation, the savings were considerable, and in line with the estimate of the manufacturer.

The plant equipment of the Wabasha Roller Mills consists of two F-M two-cycle, mechanical injection, heavy duty Diesel generating units, as follows: *Unit No. 1 eight 630 hp.*, which consists of a 630 hp., 6-cylinder, 14" x 17", 300 rpm. Fairbanks-Morse, two-cycle Diesel engine. Engine direct connected to a F-M 433 kw. @ 80% power factor, 3 phase 60-cycle, 2,400 volts, engine type alternator with direct connected 15 kw. shunt wound, Fairbanks-Morse exciter.

Unit No. 2 eight 140 hp., which consists of a 140 hp., 2-cylinder, 14" x 17", 300 rpm. Fairbanks-Morse, two-cycle, engine, direct connected to a Fairbanks-Morse, 90 kw. @ 80% power factor, engine type alternator, and a 5 kw. shunt wound, Fairbanks-Morse V-Rope Flex-Mor-driven exciter.

The cooling system consists of a dual equipment with heat exchanger, soft water pump, raw water pump, and spare soft water pump.

"DIESELS ARE PARAMOUNT"

. . . . *Continued from page 31* . . . .

and transports them to Hudson River points as far north as Troy and eastward through the Cape Cod Canal to Boston and nearby ports. R T C No. 10 is much in demand by the fifteen shippers of petroleum products she serves, because of her speed and dependability on previously arranged schedules.

Of the eleven vessels comprising the Reinauer fleet, R T C No. 10 is the only one for which a Diesel engine was purchased, the rest excepting one which is steam and will later be Dieselized, were all Diesel powered at the time the Reinauer Company purchased them. The Reinauer company maintains docks and shops on Staten Island where all its tankers are serviced.

Mr. Reinauer also owns a 78-foot yacht now powered with a gasoline engine, but since he finds much use for the yacht in his business he has recently decided to convert her to Diesel. A twin screw Atlas Imperial installation will be made in time for her next season's activities.

"Why are we so strong for Diesels?" asks Mr. Reinauer. "That's easy. From a standpoint of low operating cost and the safety factor in transporting bulk petroleum products, Diesels are absolutely paramount."

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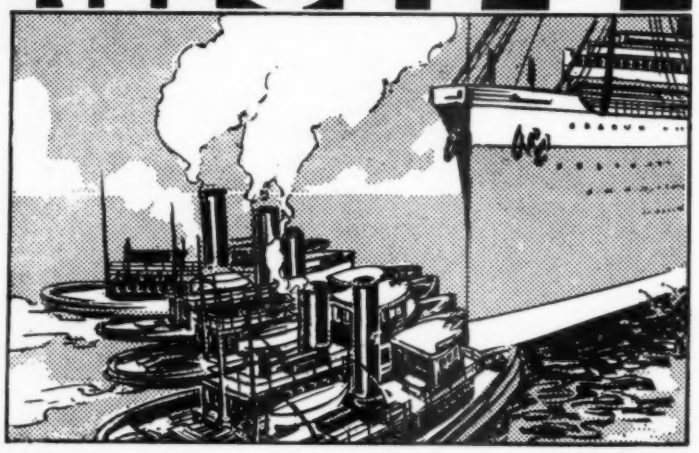

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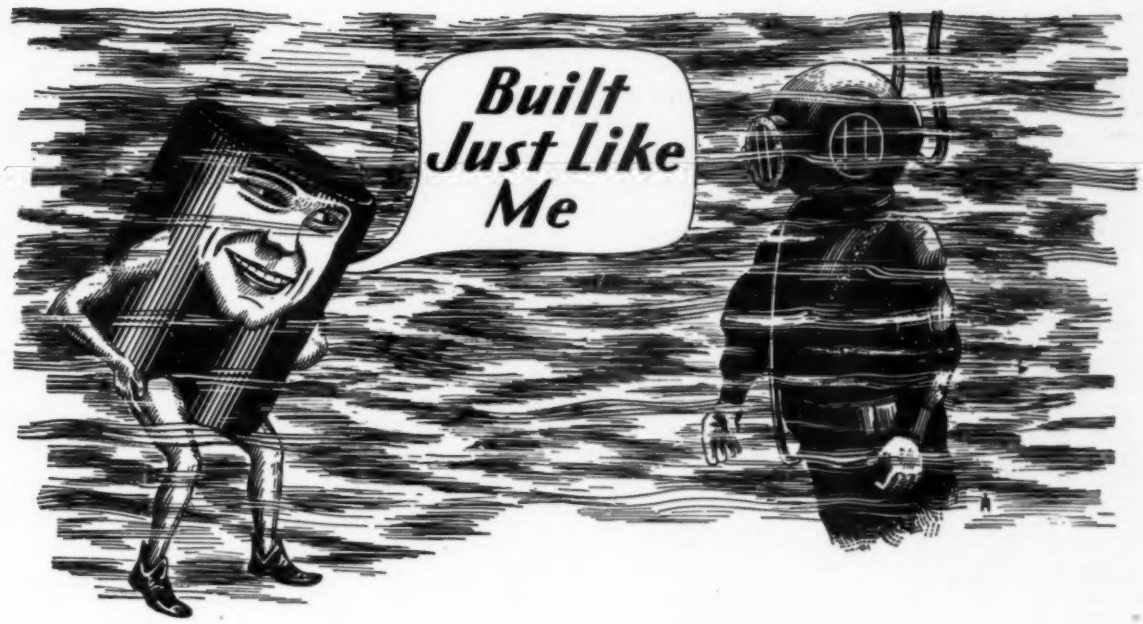

Keeps Out Dust and Dirt . . .

THERE is similarity between a diving suit and Protectomotor Air Filters. Diving suits permit clean air to enter, but keep out water and foreign substances. And Protectomotor Filters allow clean air to enter Diesel engines and air-using machines and tools, but keep out dust and grit.

Tests made by the University of California and other authorities have proven that not more than one out of every thousand particles of foreign matter in the air can ever get into Diesel engines, compressors, etc., equipped with a Protectomotor Air Filter.

By installing Protectomotor Air Filters on your Diesel engines, you can reduce such maintenance costs as liner wear, re-boring and replacement—valve leakage, grinding, refacing and replacement—bearing wear, keying-up and replacement, etc.

Protectomotor
Intake Filter

Machines operate three to five times longer before overhauling is needed. Carbon deposits are cut 60 to 70 per cent. About 25 per cent less oil is used. And compressed air is not wasted by valves sticking and leaking due to dirt under the valves.

Installed on pipe lines, the Protectomotor permits only clean, dry compressed air to reach tools and work. It removes oil, rust, scale and sediment.

Protectomotor Filters have no moving parts. Require no cleaning tanks or adhesives. Can be quickly cleaned with compressed air without removing the filtering unit.

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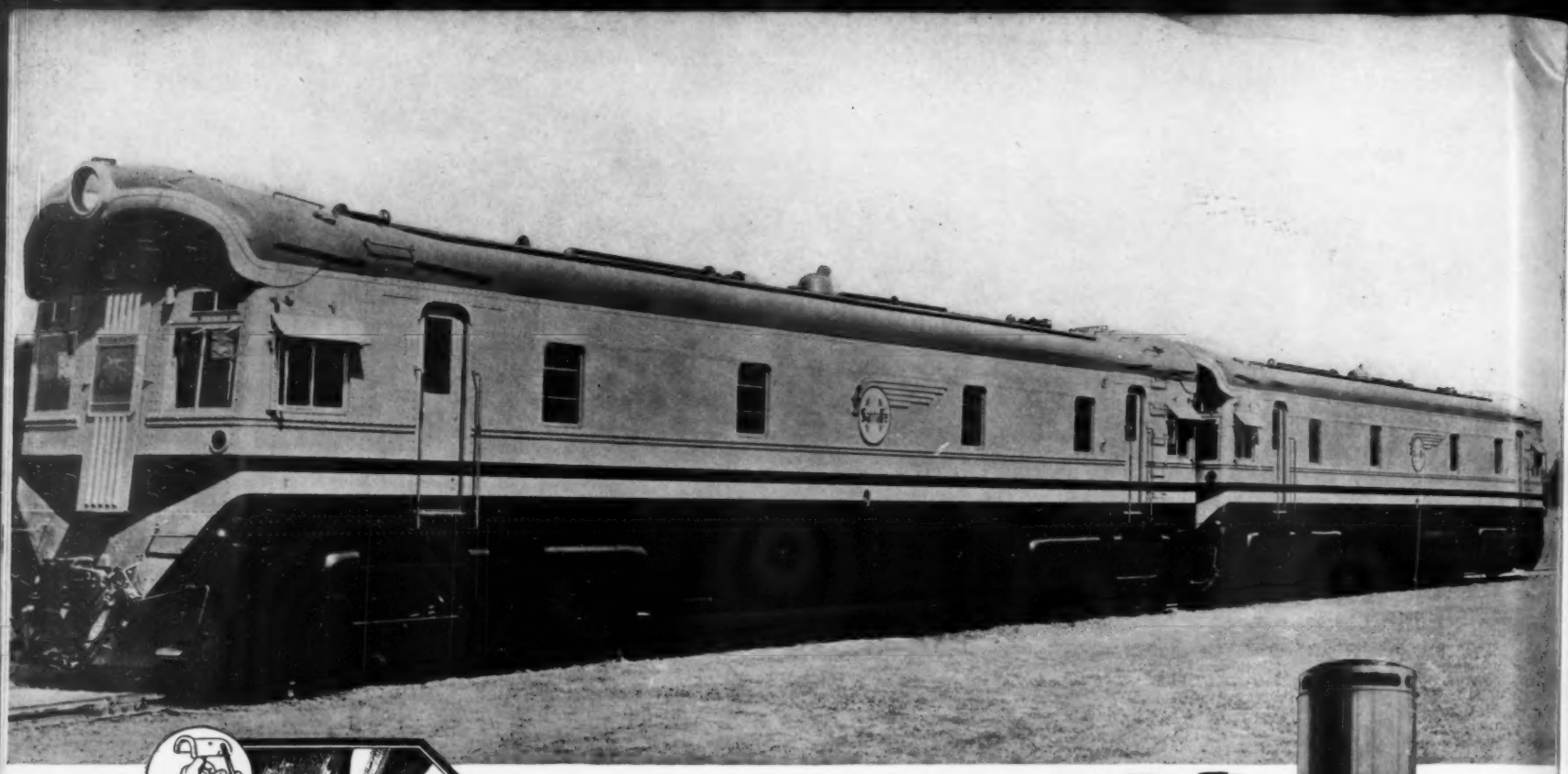

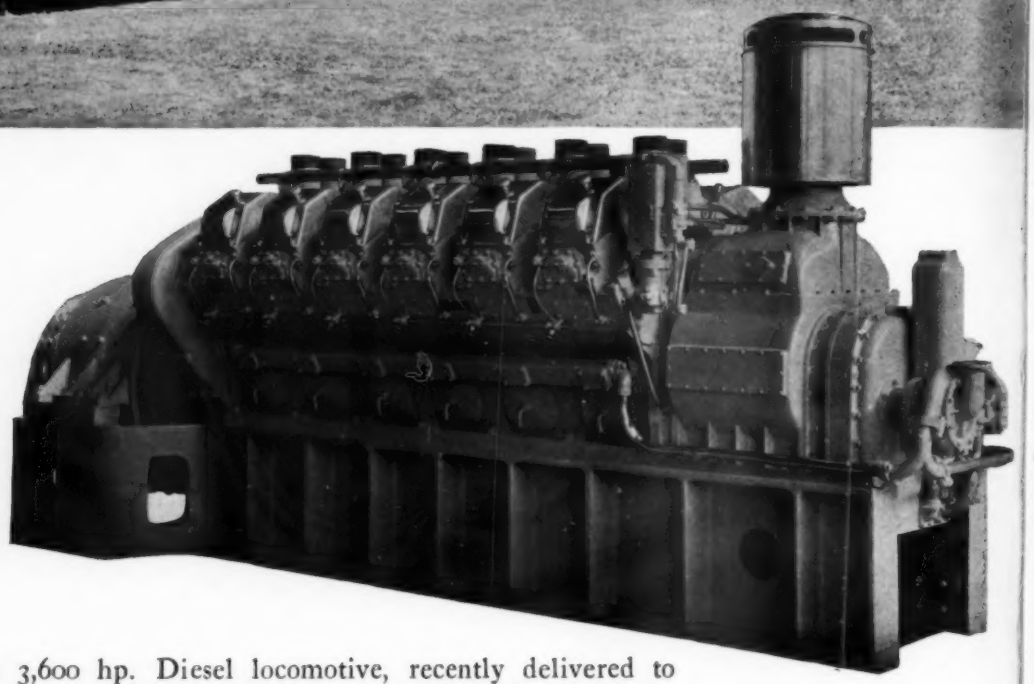

DIESELS IN SANTA FE'S NEW "SUPER CHIEF" ARE EQUIPPED WITH SATCO* BEARINGS

THE builders of the 3,600 hp. Diesel locomotive, recently delivered to A. T. & S. F. R. R., chose our Satco* metal bearings on the basis of the only test that really counts—performance. It has been our job to design and fabricate bearings for many of the Diesels which provide the motive power for America's best known trains—the trains which are awakening fresh interest in rail transportation.

The mile-by-mile and day-by-day service records of these rugged, high-speed engines prove that our bearings stand up under the extraordinary stresses and strains imposed.

We offer you the advantages of our wide experience in working out bearing problems for all types of Diesel engines.

**A patented alloy manufactured by National Lead Company. Trademark Registered.*

AMERICAN BEARING CORPORATION

AFFILIATED WITH NATIONAL LEAD COMPANY

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WHAT ABOUT THE PISTONS?

The twelve 8-inch diameter pistons that equip each of the 900 H. P. Winton-Diesels used in the new Santa Fe "Super Chief" are made of Bu-Nite metal—an unusually dense, close-grained alloy of nickel, aluminum and copper. Fine in texture and possessing remarkable wearing qualities, this metal has demonstrated its ability to stand hard, continuous service.

Progress in the design of Diesel engines to operate at higher speeds—with increased horsepower and lowered operating costs—has been one of the greatest factors in promoting the general usefulness of Diesel engines. It has been our privilege to have an important part in these developments by providing a light-weight piston that meets the most exacting requirements of the engine builders and which may be relied upon to give long, dependable service . . . In the larger, as in the smaller sizes, Bu-Nite pistons are proving their many advantages over all other types of pistons for Diesel service.

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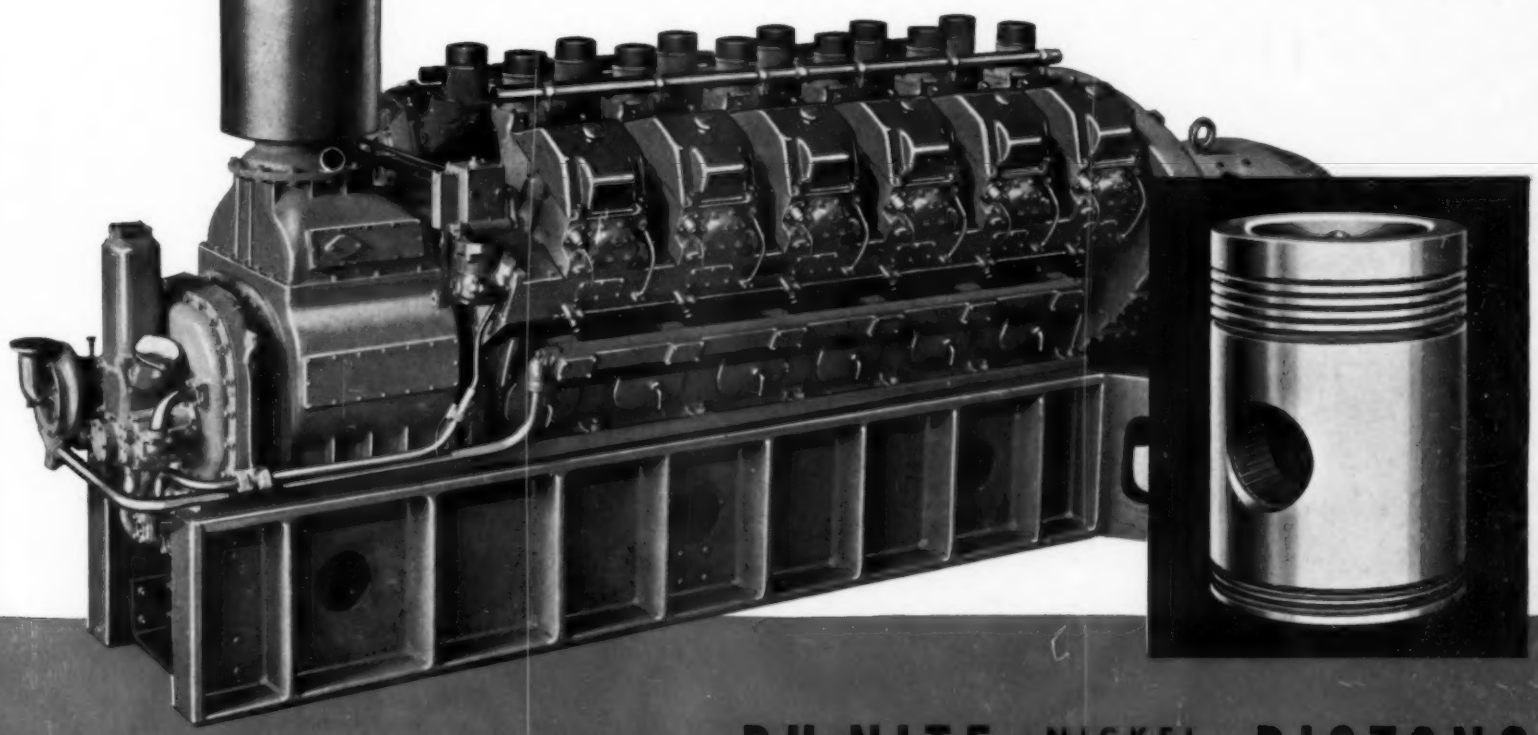
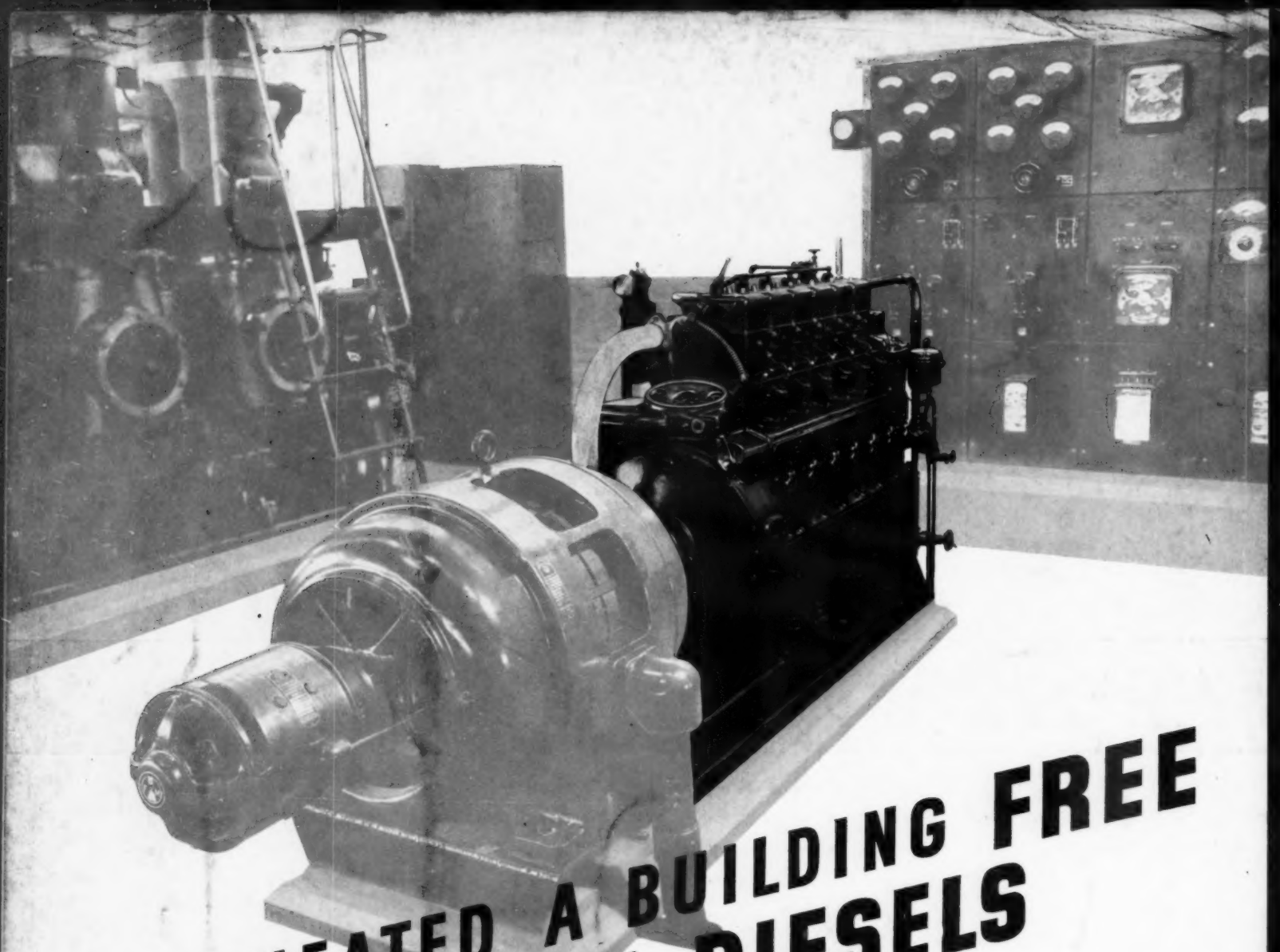


BU-NITE NICKEL ALLOY **PISTONS**



THEY HEATED A BUILDING FREE WITH F-M DIESELS

● Because Diesels are built to create power, many prospective users overlook an additional advantage that they can give — that of supplying hot water heat to all or part of the building in which they are installed.

The light weight 60 hp. Model 36-A F-M Diesel generating unit installed in the plant of the Rockford Screw Products Co., is designed to operate in parallel with a pair of 210 hp. F-M Diesels when the load requires it, but its specific use is for week-end lighting. All cooling water for all three engines is circulated through six-unit heaters thermostatically controlled to maintain a temperature of between 68 degrees and 70 degrees throughout the plant.

The power cost is less than ½c per kw-hr. The engines are run at a constant load 24 hours a day. Since the plant operates three 8-hour shifts this power cost includes all of the heating costs, which are not computed or credited to the power account. If the heating were charged separately, power costs would be about ¼c per kw-hr. The previous costs for purchased power amounted to 2.38c per kw-hr. . . . 476 per cent above the Diesel cost, including heating charges. Before the second 210 hp. unit was installed, the power company quoted a rate of 1.2c per kw.-hr. despite lower consumption. This was 240 per cent above the Diesel rate.

Can *your* plant use savings like these? If it can, get the full story on F-M Diesels before you make any contract for power or for other power equipment. Address Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. — 32 branches at your service throughout the United States.

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